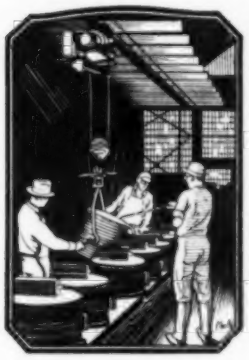
THE FOUNDRY

Established in 1892



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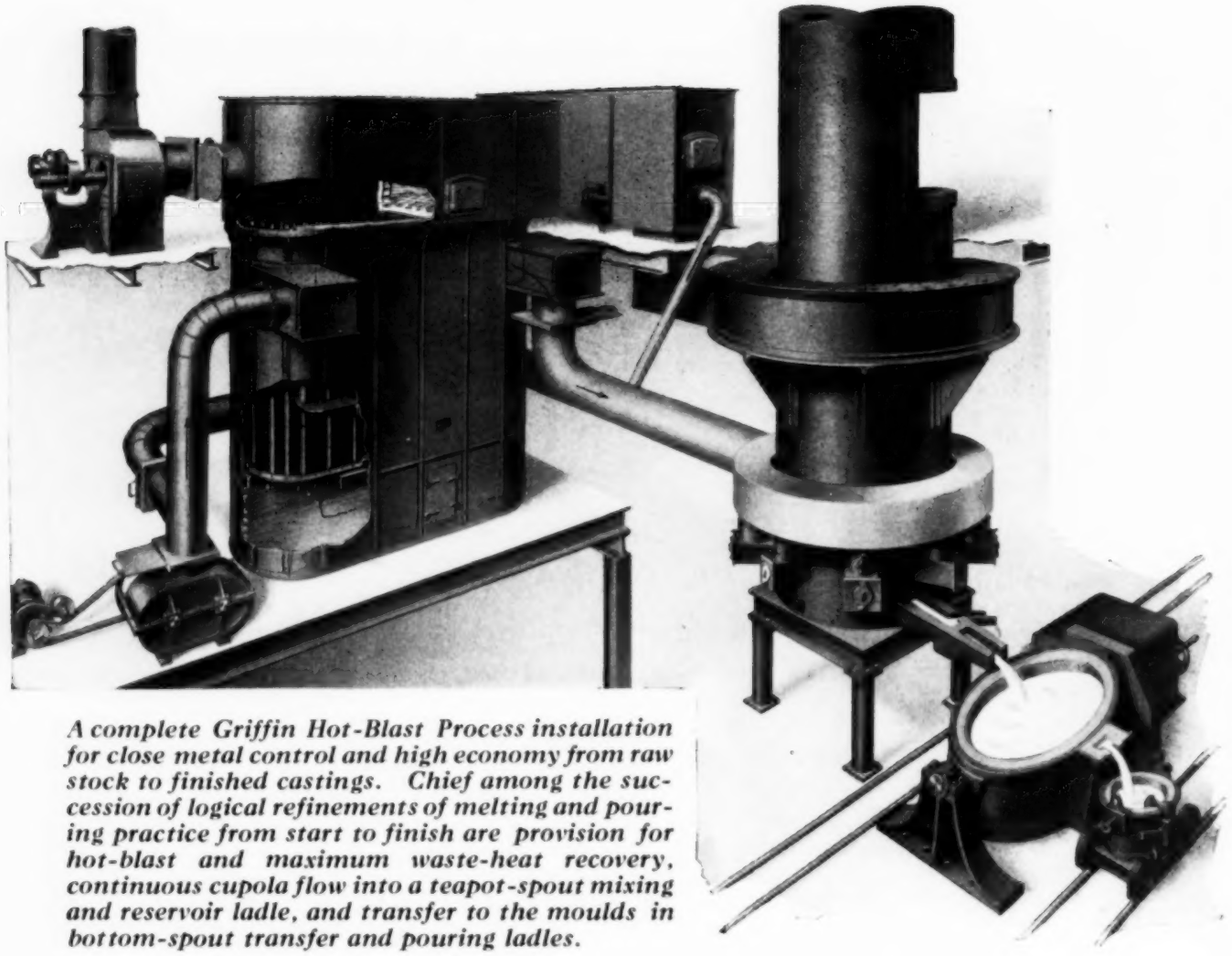

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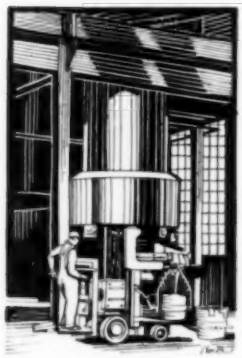

THE FOUNDRY for September

Some Still Are BLOATED

VARIOUS figures compiled by fact finding bodies relative to the decline in wage rates fail to show a true reflection of conditions, according to a far sighted malleable foundryman who has studied them. The percentage of decline distorts the perspective, shows conditions better than they are. It fails to take in account the reduction in days and hours of employment. At the same time any buying power compilation, even that which considers hours worked, rate of pay and cost of living, such as reported by the National Industrial Conference board, New York, to be 27.3 per cent decline from June, 1929 to June, 1932 shows too fat an image of real conditions. Wages do not show for foremen, superintendents, office and supervisory personnel. Wage totals fail to count the tremendous shrinkage in rural purchasing power. They overlook depleted incomes of the class that looks in vain for livelihood in unpaid interest and dividends from investments. But, they also leave out lawyers, public service employes and political officeholders. The latter shriek and shrink at 10 to 15 per cent reductions, and are still unliquidated.

Jobs With STRINGS ON

HOW much is a job worth to a man idle for months? What would an unemployed superintendent give to find a position? Many are asking themselves such questions, and not with relation to fees asked and earned by reputable employment agencies. If any foundry executive on negotiation for a new connection is asked to invest in the business of a prospective employer, he should follow the advice of the Better Business bureau, "Before you invest, investigate." Such care will be appreciated by worthy firms making such a suggestion to a prospective employe. A real opportunity to invest in a going business, to participate in the fortunes of the employing firm should be welcomed, and a share in a good business paying profits to supplement salary is sound from the viewpoint of both employer and employe. But, such an arrangement should be on a strict business basis, not a donation of an employe's savings to bolster the capital of a weak concern, or a contribution to secure a job.

Aids to New BUSINESS

BUSINESS planning, valuable in prosperous times becomes vitally necessary in periods such as the present. The American Trade Association Executives recently has set down the following steps in plan procedure:

Define really profitable market areas. Anticipate changes in volume, location and character of demand. Adjust trade operations to seasonal fluctuations and business cycles. Meet the special problems of industrial marketing, coordinating the movement of goods between industries. Simplify and standardize commodities. Develop new products and new uses for existing products. Determine the real sources of profit and loss through systematic analysis of selling costs. Plan over a long range for replacement and modernization. Stabilize employment and maintain living standards and buying power.

Incidentally many of these points are functions of trade associations now serving in the foundry industry.

What's New in SEPTEMBER

PROPHECY? No. Hope and confidence? Yes. According to a cross section opinion of the industry, (page 16). THE FOUNDRY celebrates the start of it's fortieth year, (page 19). Why some foundries can sell more castings—a British viewpoint, (page 23). Rotary furnaces burning powdered coal applied to gray iron melting, (page 26). One variable less, one known factor more, through proper sand control, (page 30).

How's Business?

Industry reveals confidence, evidenced by maintenance of equipment—Inquiry improves

By DAN M. AVEY

NO QUESTION capable of statement, no thought conveyed by any arrangement of words in the human vocabulary is of greater importance today than the one which heads this page. An answer noting improvement, any favorable comment or expression of active hope is balm to the troubled minds of men in all walks of life.

The announced plan of a midwest steel foundry to inaugurate a definite program of shop rehabilitation, as reported in THE FOUNDRY for August, aroused immediate comment. The idea was approved and several foundries in response, wrote to affirm a similar intent, or to announce the completion of such a renovizing activity. Some inquired whether any general movement of this nature was evident. Seeking an answer to one phase of the burning question in a hurried cross section of first hand opinion, letters were sent to several hundred foundries throughout the United States. These were supplemented by an additional selected group of equipment and supply firms whose salesmen are in constant contact with the foundry industry. The result has been a large number of replies, representing a fair concensus of opinion.

General Picture in Brighter Colors

Before reviewing these replies and studying their import, it might be well to scan the general business conditions which have a definite bearing upon the future prospects for improved foundry operations.

Passing over those fundamentals such as the work of the Reconstruction Finance Corp., the development of the Home Loan Bank plan, the foreign business outlook, improving stock or bond markets and the rise of farm commodities, the more immediate factors affecting foundries will be considered. Regardless of varied personal opinions on the more general phases of business, or the tinted perspective of those who for political or financial reasons discount the ultimate of any or all of these general influences, sentiment is better—much better. No amount of reporting of remote and isolated instances of improved business, news items of increased operation of individual plants or mere Pollyanna optimism could account for this marked and general improvement in tone. Hope is up several points and supported by bullish tendencies, and few, to quote an Arthur Brisbanality, are willing to "sell America Short."

Admitting all the maladjustments that have survived the strenuous leveling effect, such as utility rates, some wage and salary scales and swollen government costs, the prevalent feeling in business and manufacture is that the turn has been passed. However, few venture any specific predictions as to how rapid and steady will be the return to normality. The depression has been too hard on prophets and profits alike.

Where Castings Orders Start

Returning to the basic sources from which foundries derive their business. The railroad outlook is brighter; some of their financial ills have been treated, the pumping of credit may result in fall and winter purchases of equipment and car loadings are showing a slight rise. Operating men report that trackway is in poor shape even in comparison with wartime. Bad order car figures may closely approximate present idle car totals, since borrowed parts have done service in keeping rolling stock and motive power on the lines and vandals have taken toll from the long strings of empties on storage yards and the cold locomotives remote from constant surveillance.

In the steel industry, the announced program of $5,000,000 improvements by the U. S. Steel Corp. is supplemented by Chairman Taylor's statement that underproduction since 1929 has created a vacuum into which more steel must flow, soon. August operating rates teetering around 15 per cent hold little solid sustenance, but here again sentiment is feeding on the future. Undoubtedly, repair and replacement programs must be inaugurated to step up steel production and foundries will benefit.

According to *Steel*, improvement in sentiment,

following the rise in security and commodity prices, has given new hope to the automotive industry. Although current production figures are low and no marked improvement is expected in September, preparations are being made to advance the unveiling of new models for 1933.

Public improvements, notably extension of utilities is expected to improve with fall. Building awards showed a slight pickup in July. Production of both anthracite and bituminous coal improved in July. Textile manufacture, wool, cotton and rayon, shows increased activity with 20 per cent advance in employment. Retail stocks of commodities are extremely low and higher prices are asked by wholesalers.

So much for the background. Against this general picture, the replies to the inquiries from THE FOUNDRY bring into sharper focus the sentiment in the foundry industry.

Apparently, attention has been given by the majority of foundries to maintaining and repairing their equipment. More than 70 per cent of those responding state that most of their equipment is in shape to start at once on a normal schedule of operations. Many state that they have utilized idle time and employed their own men to carry out programs of rehabilitation. A few report that they have been employed during the past year at practically a normal rate and have carried on maintenance as needed. One malleable plant during the period from 1924 to 1929 had re-equipped the entire plant and extended facilities and during the depression has kept everything up to prime condition. Special purpose machines have been installed this year by another.

Similarly, many have purchased and installed new equipment to meet the needs of low cost production. A gray iron shop in New York is typical of this planning. Since the first of the year a complete sand handling unit, molding machines, conveyors and a change over in cupolas has entailed the expenditure of $49,000. A malleable shop has installed a hydraulic press and molding machines totaling $15,000. Another now is rebuilding sandblast and dust arrestor units. An order for two carloads of brick is on the way to rebuild an eastern open-hearth installation. Hoists, cupola repairs and molding machines are contemplated outlays in the programs of a Texas, Pennsylvania and two New England

The Unseen Elephant

The Elephant was in a dark house: some Hindus had brought it for exhibition.
As seeing it with the eye was impossible, everyone felt it in the dark with the palm of his hand.
The hand of one fell on its trunk: he said, "This creature is like a water-pipe."
Another touched its ear: to him it appeared like a fan.
Another handled its leg: he said, "I found the Elephant's shape to be like a pillar."
Another laid his hand on its back: he said, "Truly this Elephant resembles a throne."
Had there been a candle in each one's hand, the difference would have gone out of their words.

From Mathnawi of Falal-ud-Din, Persian.

foundries. Oven replacement purchases in recent months are noted in nine foundries mainly in the New England section.

An old established eastern foundry operating to provide gray iron castings for machine tools and general machinery is just completing a rehabilitation program including the installation of a new 10-ton crane, entire new sandblast equipment and the complete checking over and repair of all machines. The installation and repair work has provided employment for the firm's own men.

Several gray iron foundries have purchased electric furnaces. The Olympic Foundry Co., Seattle and Frank Foundries Corp., Moline are examples of such firms that have used the quiet period to change the character of their operations. Others are contemplating changes from cupolas to electric or powdered coal melting units.

Need Machinery to Complete Systems

A steel foundry in the midwest has, within the past three months replaced molding units with larger machines costing about $30,000 and plans the purchase of additional sand handling machinery to cost about $5000.

A gray iron foundry in Illinois installed a complete sand and mold handling unit during 1930 and 1931 which will require the purchase of about 20 squeezer machines when business warrants.

The interest of jobbing foundries in adapting modern mechanical aids to production is evidenced by two midwestern foundries. The first of these contemplates a sand and mold handling installation that will be sufficiently adaptable and flexible to care for varied demand and a rather wide range of product. This foundry also remarks on the need for some device for taking the fines out of heap sand. Something of the vacuum cleaner principle is suggested.

Changes and consolidation among some of the larger foundries made in the interest of manufacturing economy reflects the need for revamping of those plants which will be operated. Obviously, the need for operating economy which dictates the closing of some plants and diverting work to others implies that the shops that serve, must be modernized. A large pump and compressor firm gives an indication of this character of equipment demand.

Obviously, the entire answer to the question, "how's business" is not to be found in purchases of machinery to repair or replace existing facilities. Nor will it be found in the changing trend to modernize and to replace obsolete machinery. The gathering of this information and its presentation is in an attempt to evaluate sentiment in the industry. Most certainly those foundries that are buying equipment or anticipate early purchases, must see, from where they stand, definite signs of betterment in castings demand. That the foundry industry has faith in its ultimate fortune is best evidenced by the proponderance of firms that have maintained their equipment in top order, have repaired and rehabilitated idle machines and further, await only increasing operations to step forward in modernization.

Definite questions as to inquiries and orders for castings and the outlook for foundry business elicited a variety of opinion. Replies from a large number of foundries and from representative equipment firms, in touch with a great many more foundries were received. Quotations from a number of these may give a cross section of this varied opinion.

An oven firm cites four purchases of ovens intended to improve existing installations, gives nine inquiries under negotiation for replacement and five for anticipated expansion. Obviously, the latter are based upon definite expectations of improved foundry operations.

A crane manufacturer reports that representatives find low rate operations in Michigan and Wisconsin, but a much more intensive drive for business. Foundry foremen and superintendents actually are sent out to call on prospective customers to look over their needs for repair and replacement castings.

Find Inquiries Are Spotted

A portable grinder firm reports no signs of revival in the foundry business, even repair orders being slack. Tools in stock are deemed adequate for much expanded needs.

A manufacturer of sandblast and dust collecting equipment notes a marked increase in inquiries both for new equipment and repair parts. This firm points out that in previous depressions the advance in repair orders was the forerunner of new equipment purchases and was a barometer of increased foundry activity.

A pneumatic tool firm states that few repair or new equipment sales are noted. A general revival in business must precede improved foundry operations and the betterment of general business would affect foundries in a greater degree than many other industries. Another company making a similar line of products believes that it will be late fall or early spring before any number of foundries show marked increases in operation.

A molding machine manufacturer has noted improvement in parts demand and confidently expects a revival of foundry business in the fall. In direct contrast, a furnace builder holds no hope for improvement in castings demand in the early fall.

The condition in various geographical sections is reflected in many responses. Eastern Canada is much more optimistic, according to the sales-manager of a sand conditioning and handling line. This man looks for a definite upturn. Another looks for improvement in foundry business by October. New prod- (*Please turn to page* 62)

John A. Penton, founder and first editor of The Foundry. Mr. Penton now is chairman of the board, Penton Publishing Co., Cleveland.
(Portrait by National Cyclopedia of American Biography)

Entering Its Fortieth Year

THE FOUNDRY marks observance of basic purpose

THIS month, THE FOUNDRY enters its fortieth year. Founded on the vision of a man who saw an industry to be built from a number of far-flung, unrelated and disorganized castings shops, the first issue of THE FOUNDRY was launched in Detroit in September, 1892. The masthead carried the creed in a single sentence, "A Technical Journal Devoted to the Foundry Interests," and the publication has not deviated from its first established faith.

The elaboration of principles pronounced in the "Salutatory," lead editorial and the advertisement appearing on page 25 of the first number are forecasts, uncanny in their forward looking prophecy. They stated the aims and purposes and have bounded the accomplishments of the paper's first four decades.

Advances Measure Time

Forty years spans more than the working life of the majority of men identified with the foundry industry today. Few can remember from personal experience, the contrasting, primitive conditions of 1892. An enumeration of the inventions, mechanical and scientific developments of the past forty years would give a measure, but they would fill a volume. Then horsecars, surreys and cycles provided urban transportation, coal oil lamps and meager gas burners provided domestic and public illumination, the earliest ballyhoo of smoky torch light parades advanced the candidacy of Grover Cleveland for president and the population of the country was little more than half of the present census total. These facts may mark the period in the minds of old timers.

However, the modern generation may visualize better from a few facts of direct foundry purport. The up-to-date foundry of 1892 had few mechanical aids and a strong back was a molder's prime requisite. Sand was riddled, cut and tempered by hand and tested by squeezing a dampened ball to observe strength and moisture content. Iron was mixed by brand and judged by fracture. Molding machines of the simple draw plate, lever squeeze type were only a few months in use in a few foundries. The wheelbarrow was the only floor type conveyor, while wall or jib type cranes, gear operated by hand or steam, lifted loads too heavy for a gang of men to handle. Sandblasting was little known, the chisel bar, sledge and fettling brush served to clean castings too large to tumble in a primitive, unventilated barrel. The first small attempts at casting steel were but little beyond the experimental stage and the yearly tonnage of malleable could conveniently be expressed in pounds. Cast iron was used for stove parts or machinery with a few general applications to building, steam engine and pipe line needs. But in those days men were men and molders were artists with butt or pean of hand rammers, deft and clever with double-ender and slick. They learned by hard personal experience how good castings were made, and why.

To provide those men who comprised the pioneering band of the foundry industry with a medium of information and to make articulate a voiceless group, THE FOUNDRY was established.

No false modesty of those who now direct this publication should silence a tribute to the successful accomplishment and far reaching service rendered by those who have gone before. They built well. The foundry industry of today owes full measure of recognition to the conscientious, hard work of the men, who built and perpetuated this publication.

Not So Far, Nor So Fast

Advances would have been made. Mechanical aids to castings production undoubtedly would have been found. Metallurgical science would have brought better metals and alloys from the foundry to serve all industry and commerce. Technical and trade associations would have risen in answer to the gregarious instinct of castings makers. Improvements would have been found in molding, melting and cleaning castings. Safety measures would have been adopted. Betterment in cost and control procedure would have evolved. Men would have entered the industry, served and secured recognition to the advancement of themselves and the firms they served. The distribution and use of castings would have been promoted.

All of these things would have come to pass, with time, and perhaps without the aid of THE FOUNDRY. But the assertion is made and stands without fear of contradiction, that all of these milestones in foundry progress have been passed more rapidly and the present status of the industry has been reached more quickly and effectively by the aid of THE FOUNDRY. It has been and is devoted first, last and always, exclusively to the foundry industry.

The Foundry.

A TECHNICAL JOURNAL DEVOTED TO THE FOUNDRY INTERESTS.

Published Monthly by

"The Foundry Publishing Company,"

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IF YOU FAIL to receive your paper promptly, please notify us.

THE FOUNDRY is issued promptly on the tenth of each month, and will spare no endeavor to furnish valuable news and information to those interested professionally or incidentally in molding, melting, mixing of metals, foundry management, etc. Persons connected with any of these lines of industry will confer a favor upon the Editor of this Journal by sending him news from their section of the country pertaining to the foundry interests, particularly individual theories and experiences of practical value.

DETROIT, SEPTEMBER 10TH, 1892.

SALUTATORY.

We make our bow. What do you think of it?

It has been the wonder of thousands of foundrymen that the most important department of the world's most important industry—the iron industry—has never boasted a publication strictly its own. All others are more or less ably looked after by numbers of periodicals and trade journals, many of which possess much literary merit, are eagerly sought for, and enjoy a high degree of prosperity, but for some strange and unaccountable reason the foundry business has not even been in the rear of the procession, but out of it altogether.

The subject of a foundry paper is not a new idea. The attempt to supply the need is, but although always sanguine, we have been the recipients of such assurances of support and encouragement from all over the country since it has become known that we contemplated this step as have surprised us beyond measure, and demonstrated more completely than anything else could at this time, the existence of a universal demand for a paper whose sole object would be the advancement of the foundry interests and all connected therewith. We have come to stay. THE FOUNDRY is a winner, and will, it is hoped, add one more to the already long list of prosperous trade publications for which America is noted. It proposes to become indispensable to every foundry proprietor, superintendent and foreman in the country who is desirous of keeping posted on current events, and to note the improvements constantly being made on present methods. The ambitious molder will see that it reaches his home regularly, and is carefully preserved for future reference. News items from all parts of America will receive particular notice, while mechanical articles by the best writers will be given the attention so necessary for a publication of this kind, and as time goes on new features will be added, until nothing will be left to be desired.

THE FOUNDRY will stand squarely for what, in its opinion, are the best interests of the whole business. No section thereof will be overlooked, and the importance of none unduly magnified.

We ask the co-operation of all those who desire the advancement of the foundry interests. We do not propose to be easily satisfied. Constant improvement we are in a position to promise already, until no paper of its kind in this or any other country shall take higher rank.

—o—

MORE LIGHT NEEDED.

There is not a subject which gives the average foreman more cause for anxiety, or which furnishes him with more trouble from his employers, than the selecting of suitable grades of pig iron, scrap, etc., and their proper mixing for special kinds of work. In a heat where the iron is all melted from one cupola, and where the foreman is compelled to melt iron suitable for a large order of pulleys, some castings—such as a bed for a printing press (which must finish on the face absolutely without flaw or blemish the size of even a pin's head) and later a few hammer dies or castings for a chemical works, he has to exercise all his ingenuity if he desires to attain even good results. But few foremen are ever given the opportunity to become experienced on the iron mixtures involved in the turning out of a varied class of work until they find themselves face to face with the problem when the new job is in the sand, etc

Editorial page from the first issue of The Foundry reproduced in facsimile and in the original size as it appeared September, 1892.

YOU are hereby respectfully notified that the great desideratum in the Foundry business, viz: The need of a first-class foundry paper, is about to be filled by the publication of "THE FOUNDRY." The importance of the industry and everything connected therewith is such that it

CANNOT profitably keep pace with the times or other industries without the assistance of a high-grade paper, devoted exclusively to its own interests, and which would, in a live nineteenth-century manner, keep its readers posted on all matters concerning it. It will

AFFORD every foundryman in the country, whether a worker in iron, steel or brass, and whether engaged in machinery, stove, bench, architectural, malleable or car-work branches of the business, an opportunity to keep informed on all subjects pertaining

TO his business, and he cannot afford to do without it if he expects to prosper. New methods of doing any kind of foundry work, new appliances, mechanical articles by all the best writers, foundry news items fresh from all parts of the continent from an army of reliable correspondents, trustworthy market reports, and a well-conducted editorial department, will enable us to successfully

DO what we have undertaken, and publish one of the very best trade papers in the world. We believe in the future of this great and growing branch of our American industries. It is second to none in importance, and every one engaged in any of its departments should feel a personal pride in its progress.

WITHOUT a trade paper of its own, while all others have one or more, its interests have suffered, and it has been prevented from taking the rank its merits have entitled it to, but a change is about to occur, and

IT is a matter of grave importance to you personally that YOU should keep posted and know what is going on. Send in your subscription immediately on the enclosed blank. Do not put it off until next week, or even to-morrow. Attend to it now, and by that means secure a complete file commencing with the first copy.

The Foundry Publishing Co.,

172 GRISWOLD ST.,

DETROIT, MICH.

Agents Wanted in every Town and City in America, to whom a liberal Commission will be paid.

Vision and a firm faith in the industry that it was established to serve, characterized the publication from the start

Salesmanship In Selling Castings

Requires more than just the enthusiasm and forcefulness of the foundry representative

By ERIC N. SIMONS

Edgar Allen & Co., Ltd., Sheffield

THERE is more in salesmanship than selling. If you analyze a successful sale of castings, often you will find more reasons for success than pushfulness of the salesman. Summarized are a few of the reasons why orders go to one foundry rather than another:

A. Quotations are received more quickly.
B. Quotations are specific and detailed.
C. The founder can indicate ways of improving the design.
D. Delivery is right, and it is known that the promise in the quotation will be reasonably accurate.
E. The foundry has had experience with a particular casting or material.

Consider the first reason. Quick despatch of quotations begins, not in the estimating office, but with the representative on the road, in those instances, at least, where the original inquiry is obtained as a result of a visit. If quotations are made competently and quickly, the estimating department must be in possession from the start of the necessary details. Otherwise, they will have to write or wire for further information, except in those few instances where the customer is on the doorstep.

It is the salesman's job to know the details needed and to secure them. It is the sales manager's job to see that the representative knows what information is required. For the benefit of sales managers and salesmen alike, it may be as well to run briefly through these requirements.

1. Drawings or tracings showing finished dimensions and colored red to indicate parts to be machined. Tracings should show overall dimensions, and also the thickness of various parts so that a close estimate of weight can be worked out.
2. The number of castings required.
3. If possible, the weight of each casting.
4. Quality and kind of material. If the customer is in doubt, the salesman should obtain details of the duty the castings will have to perform, leaving the choice of correct metal to the works.
5. Whether rough or finish-machined castings are required. This saves time that otherwise might be spent in making out two costs.
6. Patterns in existence, or to be supplied by the founder. For gearing and large circular castings, if customers supply their own patterns, it should be made clear whether molding tackle or full patterns are to be sent, since the molding costs vary considerably for each type.

If every foundry sales manager would make a note of those points, have them duplicated on a card or sheet, and sent to all the sales force, the estimating office would bless him, and his turnover would increase. Consider the quotation itself, mentioned under (B). A foundry I knew some years ago looked upon a quotation, not as the first weapon in the battle for orders, but as a ritual, a stereotyped procedure to be got through as quickly and curtly as possible. Quoting, with that firm, was rather like shelling peas. You got the inquiry, all green and soft, and you projected from it, with a brisk and callous thumb, a hard little ball of a quotation. What happened after that didn't interest anyone. A certain percentage came back as orders, but how or why, nobody knew, though a few pretended they did.

A quotation is a sales weapon. It is no use having a salesman create a pleasant and favorable impression on a customer, and then wipe all that out with a quotation that suggests a hard-faced business man in the deuce of a hurry. I cannot do better at this point than give examples. This is the sort of quotation the firm I have mentioned used to send out:

Dear Sirs,

In reply to your esteemed inquiry of July 21, we have pleasure in quoting for

6 Manganese steel jawface castings to your drawing No. X301. . . . .
$10.00 per hundred for castings in the rough, two cored holes.
Delivered your works. Terms: Net cash, monthly a/c.
You to provide all patterns.
Delivery: Three weeks from receipt of order.

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Yours faithfully,

JOHN SMITH & SONS.

(*Please turn to page* 58)

Fig. 1—Making a high lead bronze is said to lay in manipulation rather than in the mixture

Mixing Copper with Lead

When melted with the metal mixture, certain substances prevent separation of the lead

By CHARLES VICKERS

MAKING copper and lead alloys always has been considered more or less of a secret by brass founders, due to the fact that when the percentage of lead in the mixture reaches a certain point, which may vary with the proportion of other metals also present, the lead will separate from the mixture or segregate. However, when certain metals and non-metallic substances are melted with the copper and lead, they tend to prevent such separation. Since many materials aid in preventing separation of lead and copper mixtures, all varying in effectiveness, the founder strives for secrecy regarding the flux he considers the best.

Effect of Tin Well Known

It has been an open secret for many years that tin is one of the best ingredients that can be added to a copper-lead mixture to prevent segregation of the lead and also to harden and make a homogenous alloy. All of the most important bearing alloys consist of the three metals, namely copper, lead and tin. Further addition of zinc, for some reason is not regarded with favor by many engineers, either in bearings or acid metals. Usually zinc receives discrimination in specifications. It is difficult to say what harm it is supposed to do, particularly in the case of bearings, but in the case of acid metals, it can be realized readily that the prejudice against zinc, as one constituent of such alloys, may arise from the easy manner in which it is attacked by most acids.

Cites Minimum Copper Content

The lowest percentage of copper in a bearing has been placed at 65 per cent by some authorities. An alloy of 65 copper, 30 lead, and 5 per cent tin seems to be about the limit of usefulness for tin in *holding in the lead*, as the increase or decrease of tin is ineffective in preventing segregation in the case of higher amounts of lead. In fact the 65-30-5 copper-lead-tin mixture cannot be depended upon entirely unless some aid is given the tin in holding in the lead. In some cases one per cent of nickel is added to the alloy, in place of that amount of copper, resulting in an alloy of 64 per cent copper, 30 per cent lead, 5 per cent tin and 1 per cent nickel. However, the experience of the author has not favored the addition of nickel as a means of preventing segregation of the lead.

A more reliable method has been found in the use of a flux consisting of 25 per cent sodium

sulphate, 45 per cent plaster of paris, 20 per cent sodium chloride, and 10 per cent calcined borax, thoroughly mixed together. Two per cent of it is supposed to do, particularly in the case of this flux is suggested, 1 per cent added with the cold metals and 1 per cent after the metal is molten. The second addition is stirred in and allowed to heat approximately 5 minutes. When the lead content is increased beyond 30 per cent, the tin content must be reduced to nothing as the lead approaches the 50-50 point, otherwise great difficulty is experienced in preventing segregation even when fluxes are used.

The 50-50 copper-lead mixture can be made best with the use of fluxes alone, no tin being used. The late Jesse L. Jones claimed that the secret of making a high lead bronze lay in manipulation rather than in the mixture. He claimed that neither the copper nor the lead must be allowed to oxidize to any extent or they will not amalgamate. A flux of equal parts of borax and salt, will prevent oxidation of the copper and 1.25 per cent of stick sulphur has been used to prevent the separation of the lead. He found this to be satisfactory, provided the metal was handled by skilled melters. Too cool pouring has been found to give spongy castings, and he advised reheating the metal after a few molds had been poured, if, in the molders judgment, the metal seemed too cool.

Pouring Temperature Is Important

In a paper on the subject of preventing segregation of leaded alloys in the *Transactions* of the American Foundrymen's association for 1923, Richard Edwin Lee and Fred B. Trace state the pouring temperature is all-important in casting successfully an alloy of from 70 to 75 per cent copper; 5 to 6 per cent tin; and 20 to 26 per cent of lead. Elimination of impurities and thorough mixing will not insure absence of segregation in the molds. They state that pouring temperature is the important factor and it should never be under 1742 degrees Fahr. Satisfactory castings can be made by heating the alloy above 2012 degrees Fahr. for a short time, then chilling for pouring to 1800 degrees Fahr., deoxidizing with a little phosphor copper, and pouring into partly dried sand molds.

The author can endorse this advice. However, the amount of phosphorus must be kept low, for example about 2 ounces of phosphor copper to a hundred pounds of alloy, otherwise it will promote the segregation of the lead in the alloy. While temperature has a great influence in promoting the union of lead and copper after solidification, it costs little also to use a flux in making such mixtures.

As previously mentioned there are many substances used to prevent segregation of the lead, and one worth considering is barium sulphate. An alloy of 65 per cent copper, 25 per cent lead, and 10 per cent of tin has many useful applications, because it is harder than the majority of high lead alloys, but it is a difficult alloy to make successfully. However a flux of 2 per cent barium sulphate will eliminate that difficulty, 1 per cent being added with the cold metal and the other 1 per cent stirred in after the alloy is molten.

Occasionally the tin is lowered as follows: 70 per cent copper, 24 per cent lead, 6 per cent tin. Using this formula melted in an open flame furnace, the physical properties were as follows, two bars being tested; ultimate strength 23,050 and 23,620 pounds per square inch; yield point 19,630 and 20,960 pounds per square inch; elongation 9 to 14 per cent; and reduction of area 7 to 11 per cent. The castings machined beautifully and brinelled 45. The metal was heated well, according to the Lee and Trace method, but also a flux of 2 per cent barium sulphate was used on the bath and it was deoxidized with 0.25 per cent of 15 per cent phosphor copper.

Obtain Conductivity and Soundness

Another flux, useful in promoting the union of lead and copper, is a mixture of one per cent each of calcium carbide and calcined borax. The calcium carbide is granulated, and with the borax is placed in the bottom of a crucible. Copper is melted on top of the two.

This flux was used successfully in making some bearings containing 38 per cent lead, 2 per cent tin, balance copper, in which the lead had to be well distributed. The same flux also was used in getting an electrical conductivity of 75 per cent, with sound castings. The conductivity bars were cast in sand molds and were 24 inches long by ¾ inches diameter.

The author never has agreed with those claiming that to make leaded alloys successfully both the copper and lead must be free of oxidation. Many of the most successful fluxes for the purpose will promote porosity in cast metal. In fact he has found that (*Please turn to page* 56)

Fig. 2—All of the most important bearing alloys consist of copper, lead and tin

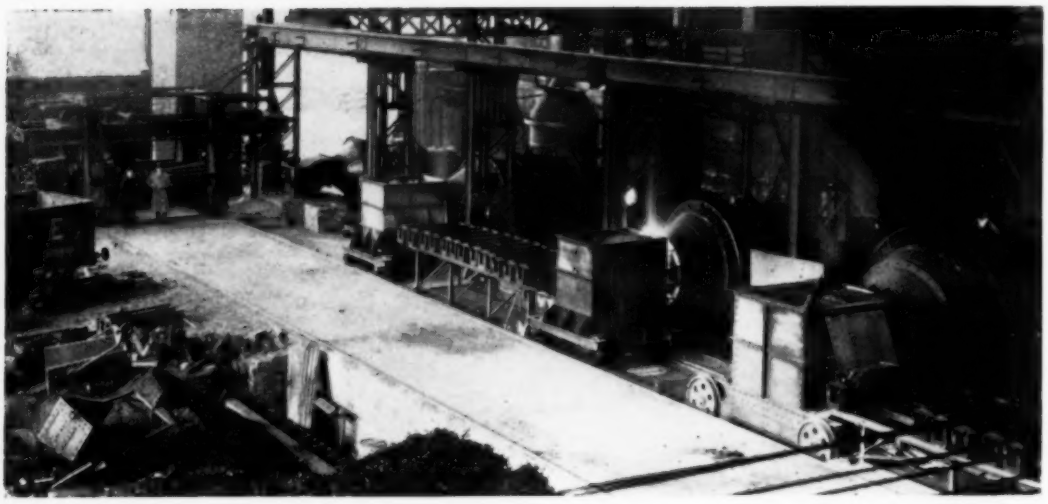


Fig. 1—The furnaces are charged by a machine which runs on a platform parallel to the line of furnaces

Melts Iron in Rotary Furnaces

Prominent British foundry installs four units which are fired with pulverized coal

By VINCENT DELPORT

European Manager, THE FOUNDRY

THE present generation of foundrymen is witnessing a definite evolution in melting methods. The cupola, which has reigned supreme in Great Britain for more than 135 years, gradually is being replaced, for certain special purposes, by the rotary furnace. Such furnaces, fired by pulverized coal or by fuel oil, sometimes electrically, have been used commercially in British foundry practice for about 5 years. Results obtained in that country show that they offer definite advantages over the cupola, and there can be no doubt that, for certain special requirements at any rate, the change has come to stay. Since it is claimed that ordinary gray iron can be melted as economically in the rotary furnace as in the cupola, and in view of the fact that there is an increasing demand for high-duty or special grades of cast-iron, for which the rotary furnace is particularly well adapted, one can visualize that in the near future, newly-erected British foundries will be equipped almost exclusively with rotary furnaces.

No better proof of this statement can be offered than the fact that one of the oldest and most prominent engineering firms in Great Britain, known the world over, has replaced an up-to-date cupola plant by a battery of four rotary furnaces fired by pulverized coal. This is certainly the first instance in Great Britain of a firm of such importance completely adapting a new melting process for the whole of its iron foundry output.

Company Has Long History

To trace the origin of the firm of Armstrong-Whitworth, one has to go back to the year 1847. In the seventies, William G. (later Sir William, and then Lord) Armstrong had made a reputation through developing water as a medium of motive power, and the Elswick works, which he then owned, were renowned for the manufacture of hydraulic machinery. About the same time, William Armstrong produced drawings of a field gun and carriage complete, and eventually he was hailed as the outstanding figure in ordnance design. His claim to supremacy was challenged, however, by Joseph, (afterward Sir Joseph) Whitworth. Following a long period of controversy and opposition, the interests of Armstrong and Whitworth were amalgamated in 1897 under the style of Sir W. G. Armstrong-Whitworth, Ltd.

Since the war the company has been recon-

structed, all interests being vested in the firm of Armstrong-Whitworth Securities Co., Ltd., a holding company, which controls Sir W. G. Armstrong, Whitworth & Co., (Engineers), Ltd., Sir W. G. Armstrong, Whitworth & Co., (Shipbuilders), Ltd., Sir W. G. Armstrong, Whitworth (Ironfounders), Ltd., and Craven Brothers (Manchester), Ltd., engineers and machine tool makers. In addition, Sir W. G. Armstrong, Whitworth & Co., (Engineers), Ltd., control Spencer-Hopwood, Ltd., makers of vertical water-tube boilers, and they are associated with British Isothermos Co., Ltd., makers of axle boxes for railroad rolling stock, and with Armstrong-Saurer Commercial Vehicles, Ltd.

Makes Automobile Castings

The foundry described in this article is that of Sir W. G. Armstrong. Whitworth & Co., (Ironfounders), Ltd., and is located at the Close Works, Gateshead-upon-Tyne, near Newcastle.

Before installing the new plant, the firm made a heavy type of engine work, mostly for shipbuilding. In view of the acute depression in the British shipbuilding industry, demand for that type of work became considerably restricted, and the firm started manufacturing castings for the automobile industry—particularly commercial vehicles—electric castings, hydraulic castings, castings for diesel engines and diesel electric engines; in fact, practically everything except chilled rolls. A substantial amount of this work calls for high-duty cast iron.

The foundry covers one big bay, about 900 feet long and 120 feet wide. A stock yard, about 62 feet wide on one side of this bay is spanned by a 5-ton overhead bridge crane equipped with magnetic hoists. The molding floor occupies the greater portion of the space. A considerable amount of molding is done in loam, and there are ten molding machines of various makes. The biggest molding machine has a table that can take flasks up to 5 x 6 feet.

The cupola plant previously used, and which has not yet been dismantled, comprises four cupolas, three of 7-ton capacity and one of 10-ton capacity. All these cupolas have a drop-bottom. The charging system was semiautomatic, the pig iron being unloaded by electric magnets into charging skips of known weight, which were picked up by an overhead crane and transferred to the weighing platform, on which the other constituents of the charge were added, and the charge then was shot into the cupolas in 1-ton charges. When this plant was operating normally, it could produce up to 100 tons of castings per 10-hour shift, from lighting up to closing down. An average of 100 tons per actual 8-hour working could be attained. The molten iron was transported to the molds in ladles, up to 16 tons, on specially designed electric trucks with a carrying capacity up to 25 tons.

When the firm was (*Please turn to page* 63)

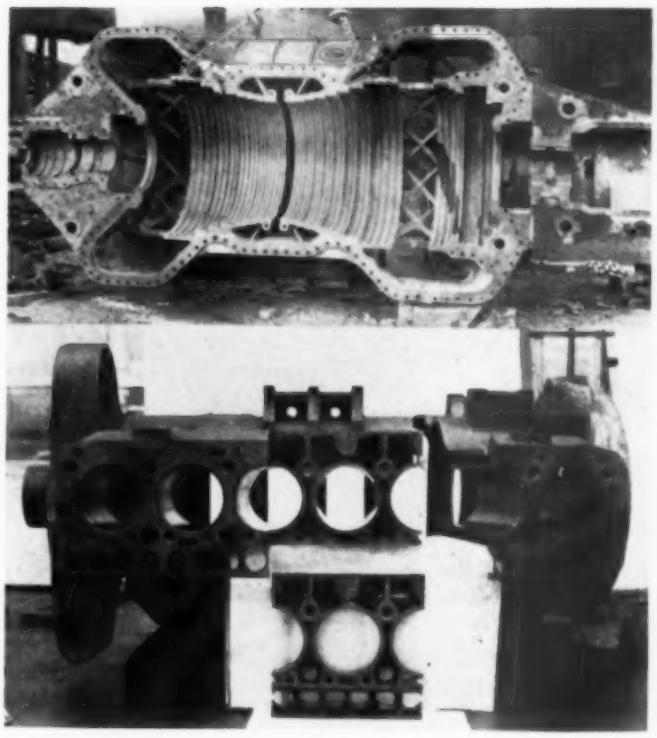


Fig. 3—(Above)—A large turbine casting made of iron melted in the rotary furnaces. Fig. 4 (Below)—Sections of a cylinder block for an oil engine

Fig. 2—The coal preparation plant showing, from right to left, the drying plant, the pulverizer and the pump

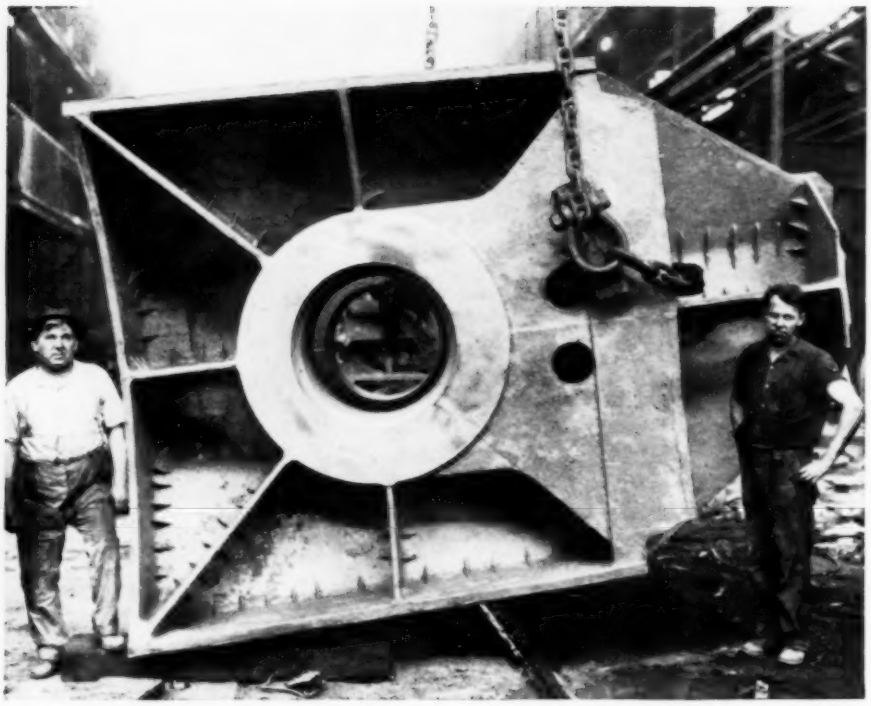


Fig. 1—Top view of the stern post casting for a new light cruiser of the 32 to 38 class

Steel Castings in the Navy

Co-operation between designer, patternmaker and foundryman essential for best results

By Rear Admiral George H. Rock

ART of manufacture of steel castings has progressed enormously in recent years, and ship designers have taken advantage of possibilities offered. While the use of steel castings in ship construction has increased greatly, unfortunately this use has not been attended with entire success, and in many cases serious embarrassment has been caused by difficulties and delays in securing satisfactory castings and the failure of defective castings actually installed.

Study of conditions leading to these failures appears to be in order, so that remedies may be suggested. Defects most generally found in many of the large hull castings are those familiar to shipbuilders—shrinkage cracks, blowholes and cavities. At times it has appeared that requirements of the designer were such that satisfactory steel castings could not be produced.

However, in each such case careful study and adoption of special measures by the patternmaker and molder have proved the possibility of making satisfactory castings to meet requirements. Apparently, the solution lies to some extent in improved foundry practice, methods of molding, chilling, size and location of gates and risers, temperatures for pouring, etc.

Continual Consultation Necessary

But that is not all, as in many cases difficulties have arisen because patterns were made by shipyards without reference to the foundryman or without knowledge of special methods, appliance and equipment to be used by the foundry in production to ensure satisfactory results. It seems axiomatic that there must be close cooperation and continual consultation between the patternmaker and the foundryman.

Indeed, a further step is indicated definitely. The designer also must consult freely with the foundryman in designing castings. Many features of design, form of castings, etc., which lead to difficulties of molding and defects in

castings, might be changed readily by the designer if informed of the circumstances. In brief, it appears obvious that to obtain full benefit from use of steel castings in hull structures, in weight saving, increased strength, and reduction in flaws, the designer, patternmaker and foundryman must have a clear understanding each of the other's problems, methods and limitations.

To accomplish that, free and continued consultations are essential. If there were no other reason for this than to make the design and pattern suit the foundry facilities, the effort would be worth while. However, the real value lies in obtaining a pattern designed to permit the foundry to obtain best results based on its experience with that particular type of casting.

Practically no two types of castings used in hull structures are alike as regards design of pattern, core boxes, location of gates and risers. It must be remembered that satisfactory steel castings of large weight and complicated design, with shape and thickness of sections changing abruptly throughout the castings, cannot be made by ordinary rule-of-thumb methods, nor without a thorough understanding of the properties of steel and its alloys when cast.

Make Each Case a Study

The foundryman must make each of these large castings a special study and design his mold only after such study. He must insist on proper casting and pattern design. The successful steel foundryman today is a good metallurgist and is qualified technically in all phases of steel manufacture.

It has been suggested, as a solution of the present difficulties in securing satisfactory hull castings, that the specification requirements for tensile strength, elongation, etc., for those steel castings be increased definitely with a view to forcing closer attention of the foundry to both manufacture and heat treatment, and, if necessary, the use of special alloys to meet these requirements. This would, of course, make the castings special and probably they could not be produced along with regular commercial castings, resulting in an increase in cost.

Fig. 2—A large steel casting for submarine V-5, pressure bulkhead

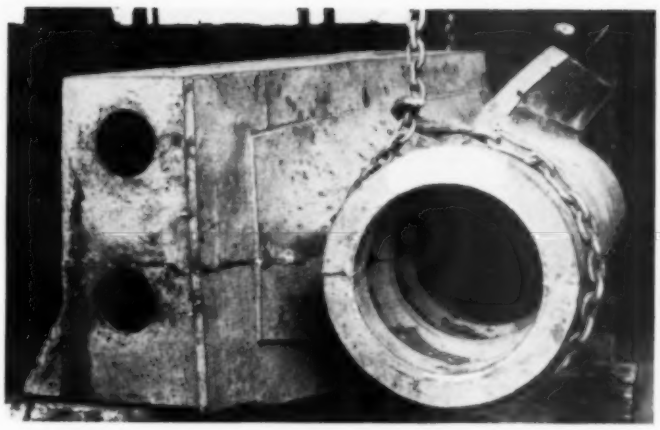


Fig. 3—Steel casting for inboard bearing for light cruiser

However, with the emphasis on weight saving, special measures are necessary throughout the construction of naval vessels, and the foundryman cannot expect to be exempted. That it is possible regularly to produce steel castings practically without flaws or physical defects may be doubted by some, but experience in the manufacture of cast steel anchor chain would seem to be ample indication of the possibilities, (THE FOUNDRY, April, 1932).

Having in mind the necessity for weight saving imposed by the Washington and London treaties on the limitation and reduction of naval armament, the importance of the use of steel castings is outstanding, and by the use of alloy steels greater strength and reliability can be secured.

Study Internal Structure

In all of the previous discussion there is a note of warning to the foundryman, as with the possibilities of building up structures with arc-welding there is a tendency on the part of the shipbuilder, having in mind the difficulties of securing steel castings, to turn to the use of structures built up by arc-welding.

A means for making studies of the internal structures of steel castings long has been desired ardently. Determination of the presence of hidden flaws—blowholes, cracks and cavities — before the casting leaves the foundry, is of great importance. Often they come to light in the machining, causing delay which often involves even greater loss. Often they develop through failure in service, with consequent inconvenience and loss. More often they remain hidden, but the thickness and sectional areas of castings are increased to discount the possibility of such hidden flaws.

Therefore, it obviously is of importance from the point of view of subsequent expense or loss to be able to examine castings before leaving the foundry, but it is also (*Please turn to page* 67)

Controlling Steel Foundry Sand

Constant quality of materials is assured through use of reasonable specifications

By A. V. LEUN

Bethlehem Steel Co., Bethlehem, Pa.

APPLICATION of sand control in the steel foundry may be divided into that pertaining to incoming raw materials, and to use of the materials in the foundry. Before describing handling of incoming materials, types of testing machines employed for such control will be enumerated. The author has found the tension test the most sensitive and accurate for green strength in sand. Apparatus used in that test is shown in Fig. 3. For determining dry strength, which is the paramount property in dry sand casting, apparatus shown in Fig. 1 is employed. Briquets are made with the rammer, employed in ramming sand for the bar test, in a specially constructed mold shown in Fig. 2. Three briquets are dried at a predetermined temperature, cooled, and broken in an electrically controlled apparatus.

Various Tests Are Made

Dye absorption test is employed in some cases, especially on clays. Standard A. F. A. test for permeability is used. Moisture content is determined by drying sand in an electric oven, weighing before and after. Screen tests are made by using the standard apparatus in conjunction with a set of screens of sizes to fit the material tested. One of the most important tests classifies clays and sands regarding resistance to metallic penetration by hot metal. This test includes ramming the refractory into an open mold, 6 x 6 x 8 inches around a pattern 3 x 3 x 6 inches. No wash or other facing is applied to the mold before drying. Mold is poured with steel at a temperature of approximately 2650 degrees Fahr. When it has cooled, the casting is removed and examined for signs of sand burning on. If a new sand or clay is under consideration this test may be run three times on the same sand, determining the loss of strength as well as the change in permeability after each burn.

Materials used in making molds, cores, etc., may be listed as: Sand, both strong and sharp; binders, such as clay, corn, flour, oils, glutrines, etc.; and silica flour. By maintaining a reasonable and yet enforceable specification on the various materials, a constant quality in the various materials when used in the foundry is assured.

A naturally-bonded semistrong sand is used in making our dry sand castings. To keep this product uniform, specifications control the percentage of coarse grains. A minimum permeability of 75 is held, and a dry strength of 8 pounds per square inch is required when rammed up, while containing 7 per cent moisture, and dried at 750 degrees Fahr. for 1 hour. The latter specification is the most important, as it assures firm molds when dried and a minimum of cutting when they are poured. For green sand casting a sharp sand is employed. It is purchased on screen analysis and on its freedom from impurities such as clay, strippings, etc.

Briquets Are Broken

In testing core oils, corn flour, resin binders, bentonites, etc., a specified proportion is mixed with a suitable washed sand that will suffice.

In our laboratory 4 ounces of the binder is mixed with 15 pounds of sand and 5 per cent water, and is mulled in a laboratory muller, or worked up by hand for 5 minutes. It then is

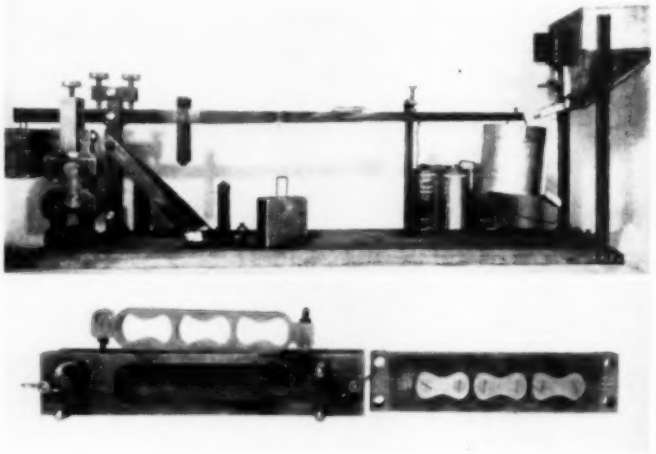


Fig. 1 (Above)—Apparatus for determining strength of sand in tension with the same type of breaker mechanism shown in Fig. 3. Fig. 2—(Below)—Special mold for ramming briquets for dry strength test

rammed into briquets, baked at the proper temperature, depending on the use to which it is to be put, cooled, and tested for dry strength by breaking. The resulting dry strength when divided into the cost of the binder per 100 pounds will give the cost of the binder per pound of dry strength.

Clay for bonding molding sand must possess certain properties such as high dry strength, high green strength and must be ground sufficiently fine to be economical in use. To determine the suitability of a new clay for foundry use, it is first mulled with Williamstown Junction sand in the ratio of 15 per cent clay to 85 per cent sand. Enough water is added to give the mix sufficient plasticity. This sand is rammed into the mold described previously, and dried and poured, the appearance of the casting being studied. This test will differentiate rapidly between good and bad clays for foundry use. It is our experience that the fusion point of the clay does not affect appearance of the castings, provided the clay is not too full of undesirable fluxes. It appears that the greater the shrinkage of the clay the cleaner will be the resulting castings.

Specification for Clay

Plasticity of clay or its ability to bond molding sand will be shown by its dye absorption. Dry strength developed by clay when used with sand and baked at a certain temperature will be indicated by the dry strength of the clay itself, dried at the same temperature as it will be subjected to in the foundry. This dry strength is determined best by ramming the clay into briquets, drying at the proper temperature, cooling and breaking. A specification for clay to be used in molding and which is in effect for our steel foundry is as follows:

The clay is to be ground finely. When worked up into plastic form, molded into standard briquets and baked at 600 degrees Fahr., dry strength in tension must be not less than 40 pounds per square inch. Dye absorption must be not less than 1800. Clay must not vitrify at a temperature less than 2300 degrees Fahr.

By adopting the proper clay, possessing good cleaning qualities, high dry strength and high plasticity, a minimum of clay will be needed to give the necessary green and dry strengths. This will aid in keeping sand from *closing up* due to continued use and accumulation of burned out clay, etc. Many clays lose their dry strength at temperatures as low as 500 degrees Fahr. These clays, while giving clean castings, necessitate a greater amount of clay to get the desired strength.

Silica flour is added to molding sand and core sand to present a tighter sand body to hot metal where heavy sections are encountered and penetration is to be kept to a minimum. It also is the basis of mold wash used extensively on dry sand molds to close the surface to molten steel. For the first use it is not necessary that the flour be as fine as when it is to be used for mold wash. A satisfactory specification for this grade of silica flour is that 95 per cent pass the 200-mesh sieve.

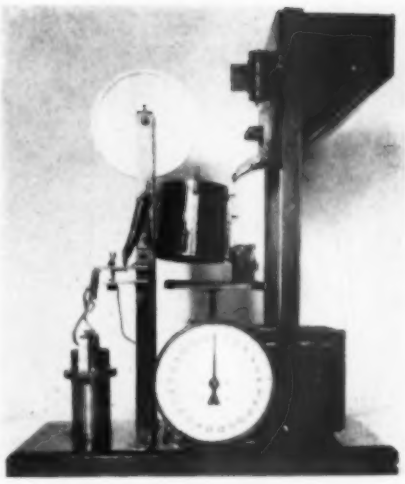


Fig. 3—Apparatus for determining green strength of sand in tension

For the mold wash, air-floated silica flour commonly is employed. Mold washes used in various foundries differ. Some add bentonite and molasses, others add a corn flour, glutrine, etc. However, a small amount of bentonite together with a small proportion of a corn flour, when added to the silica flour and water, will give a wash possessing sufficient suspension qualities and tenacity so that it cannot be rubbed off of the mold surfaces after baking. The best method of controlling silica mold wash is to maintain it at a constant specific gravity. This can be done easily with a hydrometer.

A good range in which to hold the wash for best results is between 1.350 and 1.420. If the wash is allowed to get too thin it will not coat the mold sufficiently, and if allowed to become too thick it will crack off before or during pouring. The best wash will not prevent metallic penetration if the sand is not refractory enough, the mold improperly made, or the metal poured too hot or too rapidly.

Proper Mixing of Materials

With close control over incoming materials, attention must be paid to proper mixing and use in preparing molding and core sands. In a steel foundry making castings in dry sand, dry strength is most important. It depends to a great extent, on amount and type of binder added or in the sand. It has been found that for all classes of work the dry sand strength should not be less than 10 pounds per square inch. In most cases it usually is as high as 15 to 20 pounds. Where dry strength falls below this figure, chances for cutting, washing and dirty castings are increased greatly. Maintaining this high dry strength gives strong molds after drying and makes easier core setting, etc.

Dry strength is determined by ramming the sand sample into briquets, which are baked for one hour at 750 degrees Fahr., cooled, and broken on the dry strength apparatus. Additions of silica flour decrease the dry strength of the sand but recompense for this reduction by giving a tighter, (*Please turn to page* 59)

Specifications for Gray Iron

Recently adopted as tentative classify iron according to tensile strengths of test bars

TENTATIVE specifications for gray iron castings were adopted at the June meeting of the American Society for Testing Materials, as reported in the July issue of THE FOUNDRY. The specifications in detail are as follows:

These specifications cover general gray iron castings not covered by other existing specifications of the American Society for Testing Materials. These specifications apply to gray iron castings where strength is a consideration. It is the purpose of these specifications to classify cast irons in respect to tensile strength.

Gray iron castings conforming to these specifications shall be known and listed by classes. These classes are listed according to minimum tensile strengths of test bars as follows:

Class	Tensile strength, minimum, lb. per sq. in.
No. 20	20,000
No. 25	25,000
No. 30	30,000
No. 35	35,000
No. 40	40,000
No. 50	50,000
No. 60	60,000

(*a*) Transverse tests are optional and the minimum breaking loads given in Table I are specified:

Table I

Minimum Breaking Loads For Transverse Tests

Transverse Test Bar..... Span Length..... Class	0.875 in. in Diameter 12-in. Supports Load at Center, lb.	1.2 in. in Diameter 18-in. Supports Load at Center, lb.	2.0 in. in Diameter 24-in. Supports Load at Center, lb.
No. 20	900	1700	4500
No. 25	1050	1900	5500
No. 30	1200	2100	6500
No. 35	1300	2300	7500
No. 40	1400	2500	9000
No. 50	1700	2800	11000
No. 60	2000	3100	13000

By agreement between the manufacturer and purchaser deflection values in the transverse test may be specified.

Table II

Correction Factors For Transverse Test Bars

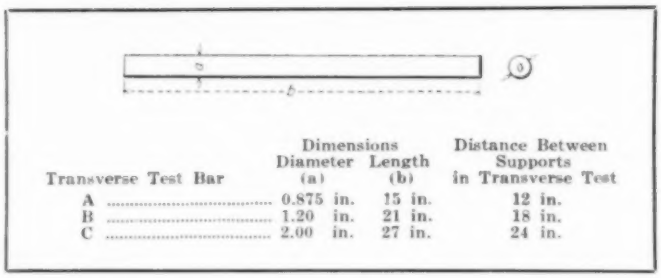
In order to correct to the standard diameter the breaking load obtained in testing the bar shall be divided by the correction factor.

0.875 in. Diameter Bar		1.20 in. Diameter Bar		2.00 in. Diameter Bar	
Diameter of Test Bars, in.	Correction Factor	Diameter of Test Bars, in.	Correction Factor	Diameter of Test Bars, in.	Correction Factor
0.825	0.838	1.10	0.770	1.90	0.857
0.830	0.853	1.11	0.791	1.91	0.871
0.835	0.869	1.12	0.813	1.92	0.885
0.840	0.885	1.13	0.835	1.93	0.899
0.845	0.900	1.14	0.857	1.94	0.913
0.850	0.916	1.15	0.880	1.95	0.927
0.855	0.933	1.16	0.903	1.96	0.941
0.860	0.949	1.17	0.927	1.97	0.955
0.865	0.966	1.18	0.951	1.98	0.970
0.870	0.983	1.19	0.975	1.99	0.985
0.875	1.000	1.20	1.000	2.00	1.000
0.880	1.017	1.21	1.025	2.01	1.015
0.885	1.034	1.22	1.051	2.02	1.030
0.890	1.051	1.23	1.077	2.03	1.046
0.895	1.069	1.24	1.103	2.04	1.061
0.900	1.087	1.25	1.130	2.05	1.076
0.905	1.106	1.26	1.158	2.06	1.092
0.910	1.125	1.27	1.185	2.07	1.109
0.915	1.143	1.28	1.214	2.08	1.125
0.920	1.162	1.29	1.242	2.09	1.141
0.925	1.181	1.30	1.271	2.10	1.158

(*b*) Transverse test shall be made on the bar as cast with central loading between supports. Corrections shall be made for sizes of bars as shown in Table II. Controlling dimension shall be the diameter of the bar at the fracture. Rate of application of load shall be such that fracture is produced in not less than 15 seconds for the 0.875-inch diameter bar; 20 seconds for the 1.2-inch diameter bar, and 40 seconds for the 2.0-inch diameter bar.

(*a*) Tension and transverse test bars shall be cast separately from the casting. Three tension, three optional tension, and three transverse test bars shall be available; size of test bar used depending upon the controlling section of the casting. Form and dimensions of the test bars are shown in Figs. 1, 2 and 3.

(*b*) Instead of using the separately cast tension test bar shown in Fig. 3, it is optional to use test specimens machined from the transverse test bars. In such cases, the form and dimensions of the optional ten-



Transverse Test Bar	Dimensions Diameter (a)	Dimensions Length (b)	Distance Between Supports in Transverse Test
A	0.875 in.	15 in.	12 in.
B	1.20 in.	21 in.	18 in.
C	2.00 in.	27 in.	24 in.

Fig. 1—Specifications for transverse test bars

sion test specimen shall be as shown in Fig. 2.

(*a*) Manufacturer and purchaser shall agree upon controlling section of the casting. Then the corresponding test bar shall be used as follows:

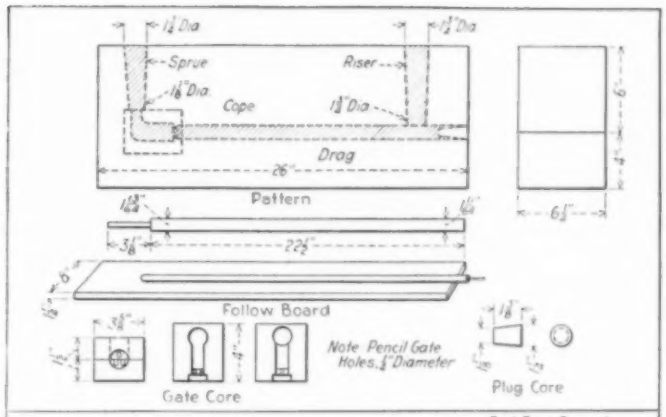
Controlling section of casting	Test bar	Nominal diameter of test bar as cast
0.75 in., maximum	*A*	0.875 in.
0.76 to 1.10 in.	*B*	1.20 in.
1.11 to 2.00 in.	*C*	2.00 in.

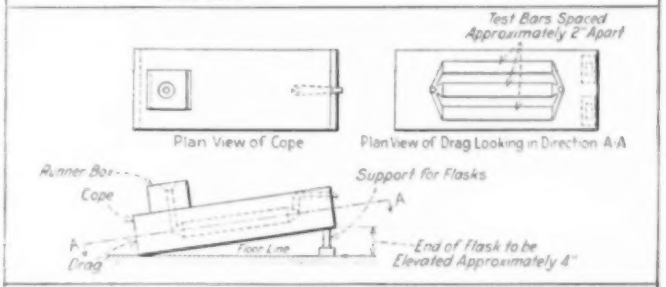
(*b*) For sections of castings over 2 inches, test bar *C* may be used or a larger test bar may be used by mutual agreement between the manufacturer and purchaser.

(*c*) The previous correlation is only approximate and may need modification for complicated castings. Test bar size for a given casting may then be determined by mutual agreement between the manufacturer and purchaser.

Tension test specimens shall fit the holders of the testing machine in such a way that the load shall be axial. Use of self-aligning shackles is recommended.

There is no definite factor for correlation between tensile and (*Please turn to page* 62)





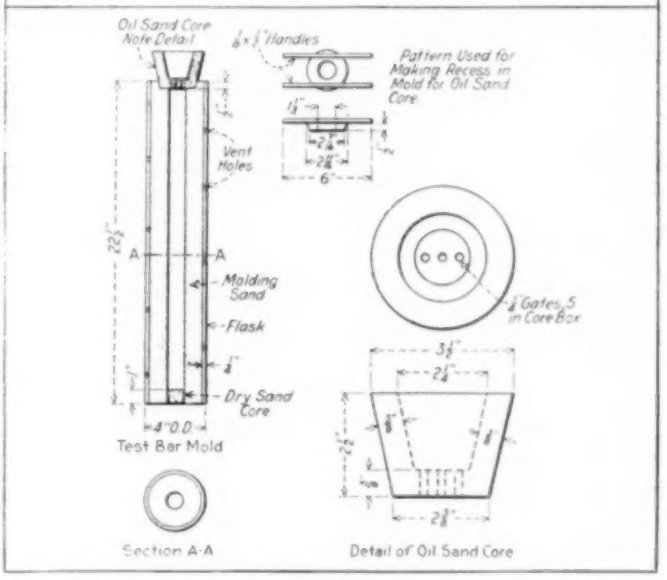
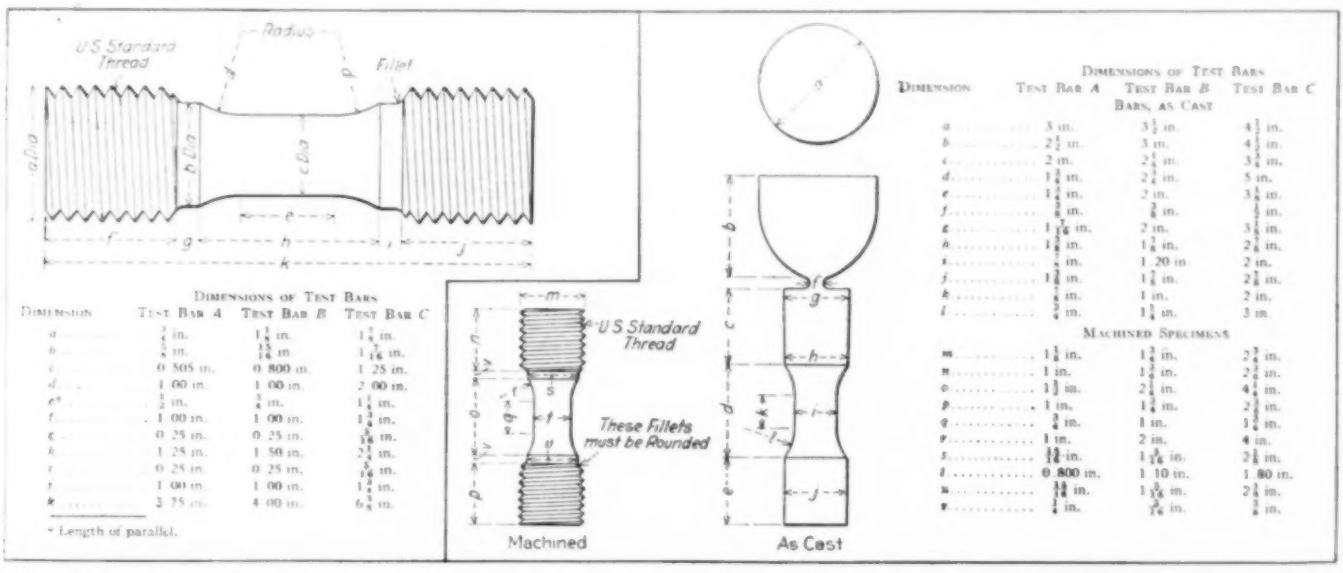


Fig. 4 (Right, above)—Transverse test bar, 1.20 inches diameter, cast horizontally. Fig. 5 (Right, center)—Test bar cast on incline. Fig. 6 (Right, bottom)—Transverse test bar cast vertically



Dimension	Test Bar A	Test Bar B	Test Bar C
a	¾ in.	1⅛ in.	1½ in.
b	⅞ in.	1⅜ in.	1 11/16 in.
c	0.505 in.	0.800 in.	1.25 in.
d	1.00 in.	1.00 in.	2.00 in.
e*	½ in.	¾ in.	1¼ in.
f	1.00 in.	1.00 in.	1¾ in.
g	0.25 in.	0.25 in.	⅜ in.
h	1.25 in.	1.50 in.	2½ in.
i	0.25 in.	0.25 in.	⅜ in.
j	1.00 in.	1.00 in.	1½ in.
k	3.75 in.	4.00 in.	6⅛ in.

* Length of parallel.

Dimension	Test Bar A	Test Bar B	Test Bar C
	Bars, as Cast		
a	3 in.	3½ in.	4½ in.
b	2½ in.	3 in.	4½ in.
c	2 in.	2½ in.	3¼ in.
d	1¾ in.	2¼ in.	5 in.
e	1¼ in.	2 in.	3½ in.
f	⅜ in.	⅜ in.	½ in.
g	1 1/16 in.	2 in.	3½ in.
h	1⅜ in.	1⅞ in.	2¼ in.
i	⅜ in.	1.20 in.	2 in.
j	1¼ in.	1¾ in.	2½ in.
k	½ in.	1 in.	2 in.
l	¾ in.	1¼ in.	3 in.
	Machined Specimens		
m	1½ in.	1¾ in.	2¾ in.
n	1 in.	1½ in.	2½ in.
o	1¼ in.	2¼ in.	4¼ in.
p	1 in.	1¼ in.	2½ in.
q	¾ in.	1 in.	1½ in.
r	1 in.	2 in.	4 in.
s	1 1/16 in.	1 5/16 in.	2⅛ in.
t	0.800 in.	1.10 in.	1.80 in.
u	1 1/16 in.	1 5/16 in.	2⅛ in.
v	¼ in.	5/16 in.	⅜ in.

Fig. 2—(Left)—Optional tension test specimen machined from transverse test bars. Fig. 3—(Right)—Tensile strength test bars cast separately

Questions and Answers

Covering important problems found in all phases of modern foundry practice

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the following advisory staff: Steel, John Howe Hall; Malleable, H. A. Schwartz; Gray Iron, John W. Bolton; Nonferrous, Charles Vickers.

Content of Manganese Is Too High for Bronze Mixture

We have an order for sleeve castings, ⅜-inch thick, which must withstand a pressure of 150 pounds. We intend to use a mixture as follows: 86 pounds copper, 6½ pounds tin, 3 pounds zinc, 1½ pounds lead, 2 pounds 50-50 nickel-copper shot, and 1 pound carbon-free manganese. Carbon-free manganese and nickel shot is to be added with the cold copper, at start of heat. The metal is to be melted in natural draft, coke-fired furnaces and will be covered with charcoal. What is your opinion of the above mixture?

From our experience we have found that 1 per cent manganese is too high for use in a bronze such as the foregoing. If manganese is used at all, it is preferable to use 0.5 per cent of manganese-copper containing 30 per cent manganese. Obtain the iron-free manganese-copper alloy.

Nickel frequently is added to alloys used for pressure castings usually in the form of an alloy of 50-50 copper-nickel and is claimed to be beneficial in making tight castings. Usually nickel shot is deducted from the content of copper giving 84 per cent copper; 6½ per cent tin; 3 per cent zinc; 1½ per cent lead; 2 per cent nickel-shot and 2 ounces phosphor copper.

Mix Plaster of Paris With Other Molding Materials

We understand that plaster of paris molds are used for making white metal castings. Can you tell us whether plaster alone is used, or is it mixed with other materials?

Plaster of paris can be used alone, but usually other materials such as ground brick, carborundum firesand, fireclay, and pulverized asbestos are added. For example one mixture is made from 1 part plaster of paris, and 2 parts of ground brick dust with sufficient water to give it the proper working consistency. Addition of a little shredded asbestos is suggested so that if the mold cracks during drying, the fibers will hold it together. Another mixture is composed of 4 parts plaster of paris, 1 part fireclay, and 1 part asbestos fibers. The carborundum firesand could be substituted for the brick dust or the fireclay in the formulas. The molds must be dried thoroughly before use. When plaster alone is used, it is rather difficult to dry the molds rapidly, and that is the reason that brick dust, etc. is added. Those materials open the plaster up sufficiently to permit the steam to escape. They also aid in the escape of gases when the mold is poured.

Use of Chill Copes Is Not Advisable for Brakeshoes

We have an order for motor brakeshoes 1½ inches in which the customer specifies that the casting shall be chilled to a depth of ¾-inch and carry six steel or chilled cast iron inserts ¾-inch in diameter. Would you advise casting these shoes concave side up and using a chill for a cope? What is the proper thickness for the chill and what is a good metal mixture for the shoe?

We can see no advantage in using a chill plate for a brakeshoe cope. On the contrary the proposed practice presents many disadvantages. The wearing face of the shoe must be absolutely clean and solid, therefore it must be cast down. Minor imperfections, sand or slag inclusions, shrinks or small cavities may be tolerated on the back or cope side of the casting, but are sufficient to condemn it if they appear on the working face. Where the shoe is cast in the ordinary position, that is face down, the molder can handle the comparatively light cope by himself. At least two men would be required to handle a heavy chill employed for a cope.

Preparation of these chills entails an expense that neither is necessary nor warranted. We are at a loss to understand why the casting has to be chilled and to carry chilled inserts in addition. It does not seem reasonable that the customer

wants the brake drum to wear out before the shoe. If the face is chilled, why the inserts? Brakeshoes in railroad service are not chilled on the face, notwithstanding the fact that they are designed to operate in contact with the chilled tread of the wheel. In fact the braking effect is achieved through the difference in hardness between the shoe and the wheel. The steel or hard iron inserts prevent the shoe from wearing away too fast. A hard iron mixture suitable for brakeshoes conforms to the following aprximate analysis: Silicon 1.40 per cent, sulphur 0.08-0.10 per cent, phosphorus 0.50 per cent, manganese 0.50-0.70 per cent.

Jolt Machine Spoils Molds Laid on Other Floors

We are using a 42 x 60-inch plain jolt machine and are experiencing trouble in having finished molds some distance away damaged through the jolting they receive when the machine is in operation. Suggestions you may have regarding a method of cushioning the machine will be appreciated.

A variety of causes may be given for the shock which damages the mold. The soil upon which the foundation is built may be a *fill*, and therefore does not give the proper support. The soil may be saturated with water, and in that case the transmission of shock would be severe. The area and weight of the foundation may not be sufficient for the particular kind of soil upon which it is built. If any one or more of these conditions exist, they should be corrected.

The jolt valve stem may be worn on the lower end so that it is not holding the compression or cushion air that is required to cushion the blow to a place where the sand packs correctly, and still prevent the transmittal of shock to the foundation and soil. The cushion can be changed to suit, if the valve is not worn too much. After a thorough investigation it ought not to be difficult to arrive at the cause or causes of the difficulty.

Use High Nickel Alloys For Making Dairy Equipment

We have been called upon to supply a white metal alloy casting for use on diary equipment. The alloy must not contain zinc, must polish and machine well, and withstand about 60 pounds per square inch pressure. The customer has expressed a desire for a nickel alloy casting.

Since the alloy undoubtedly will come in contact with milk or an allied product, there is little choice of an alloy as it appears that pure nickel or monel metal are least attacked by those materials. Aluminum is not attacked by milk, but due to the use of chlorine containing sterilizing agents which do attack aluminum severely, it is not used to any great extent except for pails, etc. Recently it has been claimed that a nickel-base alloy low in iron and containing chromium has been developed which is suitable for dairy equipment. We do not have any data on its composition as yet. The alloy is supplied in rods, sheets, and castings.

Make Safety Treads in Molds Faced with Abrasives

We would like to know how abrasive coated, cast iron, safety treads are made. How is the abrasive applied, and what is used? Does the abrasive harden the metal?

We understand that the production of cast iron, safety treads coated with abrasives is a proprietary process. The abrasive usually employed is silicon carbide, but probably aluminum oxide abrasive could be used as well. To produce the abrasive surface, the mold is made in the usual manner, and then the cope and pattern are removed. The drag surface is sprayed with a solution of silicate of soda in 6 parts of water. The face of the mold is coated with a thin layer of silicon carbide grains put on preferably by screening. If the treads are thick, large grains are used, and if thin small grains must be used. The pattern is pressed back to insure an even surface, and then the silicon carbide grains are sprayed again with the silicate solution. The surface is dried with a torch, and after it is cool, powdered fluorspar is riddled on. Just enough of the latter is used to give a thin even coating.

The silicate of soda and the fluorspar cause a partial fusion of the abrasive grains and cause them to stick to the iron. The mold is gated so that the metal will run over the full length of

Slag rising in the ladle, as the heat is poured, overflows into the receptacle at the right. Photograph by Margaret-Bourke-White for the Otis Steel Co., Cleveland

the mold face to an overflow. The iron of necessity must be extremely hot, and a little is run through the overflow to insure the proper fusion taking place. Then the overflow is plugged.

Acid Is Resisted By High Silicon Iron

We desire information on composition and manufacture of high silicon iron castings for acid-resisting purposes. Can it be melted in a cupola and poured into sand molds according to the usual foundry practice for gray iron?

There are a number of high silicon, acid-resisting irons produced under trade names, with compositions covered by patents. Usually the irons contain from 13.5 to 15.0 per cent silicon; 0.25 to 2.50 per cent manganese; 0.20 per cent phosphorus; and 0.75 to 1.25 per cent total carbon. The iron cannot be produced in the cupola due to the losses in silicon that would be entailed, but is melted in air or electric furnaces.

High silicon irons are extremely difficult to handle due to the high shrinkage factor and to its fragility at red heat. Molds must be supplied with heavy gates and risers to feed the castings properly and molds must be constructed so that little resistance is offered to contracting metal. If that is not done, the casting will crack and tear. Manufacture of high silicon, acid-resisting castings is a specialized field, and considerable experimental work will be necessary before such castings can be produced on a commercial scale.

Vertical Billet Molds Are Top Gated

We shall appreciate any information on the subject of billet molds in which molten iron, steel and copper are poured. These molds vary in size. The largest is 8 inches inside diameter, 15 inches outside diameter and 6 feet in length. They must be close grained and machinable, also without flaw of any kind especially on the inside. What is the best way to gate these molds? Is loam preferable to dry sand for a core, or vice versa? What is a suitable analysis for the iron? What is the proper temperature at which to pour the metal?

The best way to gate billet mold castings is through a ring of pop gates on the top after the manner in vogue in the pipe shops. Either loam or dry sand cores will serve satisfactorily provided they are made properly to allow the rapid escape of gas. One advantage of the loam core is that it is accurate to size and shape. This is not always true of dry sand core made in halves and pasted. Unless a large number of castings are ordered, the barrels for the loam cores constitute a heavy expense.

Due to the alternate expansion and contraction to which the molds are subjected in use they should be made from an iron low in phosphorus and sulphur. This means a generous amount of bessemer, charcoal or malleable pig in the mixture. Ingot mold scrap is the best to make up the remainder of the charge. A typical analysis is: Silicon 2.00 per cent, sulphur 0.07 per cent, phosphorus 0.20 per cent, manganese 0.80 per cent.

Temperature of the metal is not an important factor so far as the life of the molds is concerned. It should be poured as cold as possible to secure a clean skin on the casting, but, and this is an extremely important feature, it should not be cooled to a point where it will foster the retention of dross or bubbles. The foregoing refers to the maximum size casting.

It is practically impossible to make a satisfactory casting of that size and shape in a horizontal position. Modifications in method and analysis may be introduced in the smaller sizes. Many of these billet molds are cast in halves. They are molded and cast face down horizontally and quite satisfactorily in green sand molds. The mound of sand on the drag is vented with a long rod which is pulled out through a hole in the end of the flask.

High Temperature Ruins Burner Castings

We are interested in obtaining information on the most suitable iron or alloy iron for range burners. We have tried chromium additions with varying results. Oil used for fuel is distilled to gas in the castings, and in some instances the iron seems to crumble and rot away. The heat generated is about 1200 to possibly 1700 degrees Fahr.

If the temperatures mentioned are correct, we doubt that a suitable gray or alloy iron will be found unless it be one containing about 15 per cent nickel; 7 per cent copper, and 4 per cent chromium. According to the color-temperature chart 1200 degrees Fahr. is a dull cherry red, and 1700 degrees is a light orange, and it is suggested that you look at the castings in operation to check the temperature. The alloy iron may be produced in the cupola, but better control is said to be obtained through electric furnace melting. In cupola melting monel metal which supplies the nickel and copper content, is added with the iron charge. About 23 per cent monel metal is used to obtain the desired nickel and copper content. The chromium is added in the ladle in the form of ferrochromium.

Copper-Base Alloys To Resist Acid Attack

Recently I was asked to make some paper mill bronzes that are to work in hydrochloric and sulphuric acids. I never have had any experience with paper mill castings as my experience has been confined to mine brasses and bronzes.

An old and well known bronze that is used for paper mill castings is that called *Old Perfection* bronze. It contains 88 per cent copper, 10 per cent tin and 2 per cent lead. It can be made by melting 86 pounds of copper, 10 pounds of tin, 2 pounds of lead, and 2 pounds of 15 per cent phosphor-copper, but to obtain sound castings it usually is necessary to add zinc. Consequently, the charge is made up of 84 pounds of copper, 10 pounds of tin, 2 pounds of lead, 2 pounds of zinc, and 2 pounds of phosphor-copper.

To resist hydrochloric acid, it will be necessary to employ a special alloy for that purpose, and if steam and air are present the acid will attack the metal. For example, it is claimed that a proprietary alloy composed of 94.4 per cent copper, 4.5 per cent silicon and 1.1 per cent manganese will resist all strengths of hydrochloric when cold, if air is absent, and hot acid up to 20 per cent concentration at 158 degrees Fahr. in the absence of steam and air. It is said it will resist all sulphite solutions hot or cold as used in sulphite pulp mills; sulphuric acid up to 95 per cent in the cold, and up to 50 per cent concentration hot in the absence of oxidizing agents. The alloy may be purchased in ingot form.

A Correction

THE FOUNDRY is indebted to an anonymous commenter for calling attention to an incorrect statement in the Question and Answer department in the August issue. On page 30 of that issue, under the heading "Leaks in Valves Caused by Thin Sections," a mixture is suggested for high pressure valves, which our correspondent points out steam plant operators would consider too high in lead.

Specifications for steam bronze castings for valves, flanges and pipe fittings of the Manufacturers Standardization Society of the Valve and Fitting Industry give the following chemical compositions for valves: For regular bronze for saturated steam, copper 83 per cent minimum, tin and zinc (combined) 8 per cent minimum and lead, 6 per cent maximum, for higher strength bronze for superheated steam, copper 84 per cent minimum, tin and zinc (combined) 9 per cent minimum, and lead 2.5 per cent maximum.

Viewing Foundry Developments

At Short Range

—Courtesy Charles Perry Weimer

FINISHES possible in cast metals constantly are increasing. For example, a parlor type coal heater now on the market has an exterior of cast iron finished to resemble bricks. The iron is grooved to represent the individual bricks, and where the end is exposed, the ridges, produced in brick by the process of cutting, also are shown. The surface of the iron is coated with enamel and fine sand is blown on the *brick* parts before being placed in the oven. The effect is pleasing as well as striking, and a dealer reports considerable interest and sale.

♦ ♦ ♦

Manifold core for the Ford eight, weighing 2 pounds, is being blown through eight 13/32-inch diameter holes in the core box. The core is 13⅜ x 6 x 5¾ inches and the box is 18 x 18¼ x 5¾ inches.

♦ ♦ ♦

INSTALLATION of a false roof, substitution of smaller electrodes and alteration in transformer equipment changed a 6000 pound direct arc furnace to a 1200 pound unit. This accommodated smaller heats and resulted in a demand charge saving of several thousand dollars to a midwestern steel foundry.

♦ ♦ ♦

A small foundry in the oil fields is using a zirconium silicon ladle addition to produce a graphite piston ring for oil pumping machinery.

♦ ♦ ♦

Over-oxidation during the melting of open-hearth heats is retarded greatly by the use of pig iron containing from 1 to 1.30 per cent silicon according to an Ohio steelmaker. Practice at this plant also shows that iron with 2 per cent manganese increases the slag fluidity, assists in the removal of silicates and nonmetallic impurities and improves the quality of the steel.

♦ ♦ ♦

Thirty-two steel castings each weighing 180 tons cradle the gigantic 36-inch cables that support the new George Washington bridge across the Hudson river. The castings are 8 x 8½ x 21 feet and are located 600 feet above the river in the bridge towers.

♦ ♦ ♦

Better running conditions are obtained from remelt ingot metal than from heats of virgin metal when casting the red brass mixture, copper, 85; tin, 5; zinc, 5 and lead, 5. Pouring temperatures between 2000 and 2100 degrees Fahr. are recommended.

♦ ♦ ♦

TESTS on an alloy iron camshaft run for 500 consecutive hours in a 100 horsepower automobile engine at full throttle showed only appreciable wear at the gear operating the oil pump shaft. The composition of the shaft was 3.15 per cent total carbon; manganese, 0.48 per cent; silicon, 2.34 per cent; molybdenum, 2.25 per cent; nickel, 1.70 per cent, and chromium, 0.08 per cent.

♦ ♦ ♦

Lead, tin, antimony bearing metals show higher mechanical properties with increase of the tin content.

♦ ♦ ♦

Vertical fins ½-inch deep and spaced 1-inch apart, are included on the exterior of the furnace casting of a parlor type heater, thus providing greater radiating surface for the heat.

♦ ♦ ♦

Bureau of standards service tests show that tin-base bearing alloys have higher wear resistance than hardened lead or the lead-tin-antimony types of alloys containing about 3 per cent tin.

♦ ♦ ♦

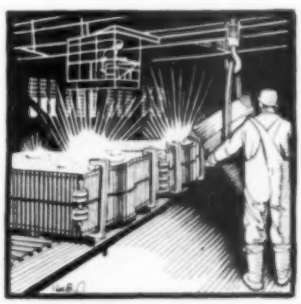
A large producer of boiler sections and radiation is operating cupola burden with 100 per cent scrap for the former castings and 93 per cent scrap for the latter. This is accomplished by the use of fused soda ash. A large producer of sanitary specialties is also a convert to soda ash, employing almost incredible percentages of scrap in their cupola practice.

♦ ♦ ♦

A LARGE automotive foundry employs a method for removing loose particles of sand from pouring basins that is quite simple, and that can be adapted for the same purpose for other parts of a mold. Instead of using an air line to blow the dirt out, a small inspirator is attached to the air hose and a short piece of 1-inch hose is attached to the suction opening of the inspirator. To use the device, the operator places the end of the suction line in the basin and opens the inspirator valve. In a few sweeping movements the loose particles of sand are removed rapidly and safely.

♦ ♦ ♦

Hard ramming, with an air hammer if possible, and plastic patching material worked on the dry side is



recommended in repairing linings of electric furnaces operating on brass. Gannister and fire clay mixtures or prepared high temperature cements, used thus, immeasurably prolong the lining life.

♦ ♦ ♦

While the bases of many of the electric clocks sold in this country are zinc-base die castings, recent indications are that some manufacturers are turning to zinc alloy bases produced by slush casting.

The FOUNDRY Family Photograph Album

Upper Left
JAMES C. SMITH
John Bean Mfg. Co.,
San Jose, Calif.

Upper Right
NEIL I. MCARTHUR
Great Lakes Foundry Sand Co.,
Detroit

Lower Left
CHARLES P. MILLS
Empire Steel Castings Co.,
Reading, Pa.

Lower Right
H. J. HARTMAN
H. J. Hartman Foundry Co., Grand Rapids, Mich.

Men of Industry

Whose Activities Are Making Foundry History

J. R. Thompson, works manager Trafford Works, Westinghouse Electric & Mfg. Co., Trafford City, Pa., retired from active service on Aug. 1. Mr. Thompson's connection with the Westinghouse Company began in 1897 when he was employed with the Westinghouse Machine Co., as a time clerk. Later in the year he was made paymaster. In 1901 he served as assistant purchasing agent and then went into the accounting department. Mr. Thompson became associated with the Trafford works in 1904 and was made assistant to the manager in 1908. He held the position of acting works manager from 1925 to 1927 when he was made works manager.

William G. Ferber, for the past 35 years connected with the foundry industry, has become associated with R. P. Molinari in the real estate business in Philadelphia. Mr. Ferber was born in Scranton, Pa., and in 1900 completed his apprenticeship. When the Allis-Chalmers Mfg. Co., Milwaukee, acquired the Dickson Mfg. Co., where he had served his apprenticeship, Mr. Ferber was made foreman. He remained with the Allis-Chalmers company as foreman and assistant superintendent at the foundry until 1913, serving at both the Scranton, Pa., and West Allis, Wis., plants. He then accepted a position with the Worthington Pump & Machinery Corp., Harrison, N. J., and continued with that company for a number of years. He also has been connected with the Pennsylvania Bronze & Brass Co., the Cramp Brass & Iron Foundries Co., and the Baldwin Locomotive Co.

William R. Mample has accepted the position as foundry superintendent of the Badger Meter Mfg. Co., Milwaukee. Mr. Mample has had considerable experience in the production of nonferrous castings, especially aluminum castings for the automobile industry. He has worked in plants in Detroit, Cleveland, Buffalo, Bridgeport, Conn., and Manitowoc and Waukesha, Wis.

Robert P. Lamont, until Aug. 3, secretary of commerce in the cabinet of President Hoover, has been elected president of the American Iron and Steel institute, New York. Mr. Lamont resigned the presidency of the American Steel Foundries, Chicago, in 1929, to enter the cabinet. He had been vice president of the American Company from 1901 until

J. R. Thompson

1923 when he was made president. His directorship has included the American Radiator Co., Damascus Brake Beam Co., Internationl Harvester Co., and Globe Steel Tubes Co.

R. E. Williams has been made president and general manager, D. A. Ebinger Sanitary Mfg. Co., Columbus, O., succeeding D. H. Ebinger recently resigned.

Fred S. Thompson, formerly vice president in charge of sales, M. L. Oberdorfer Brass Co., Syracuse, N. Y., has left that firm to establish a sales and marketing service with offices at 527 South Warren street, Syracuse.

W. W. Brierly has resigned his position as president and general manager of the Millbury Steel Foundry Co., Millbury, Mass. to become associated with the Malleable Iron Fittings Co., Branford, Conn., as district manager, steel castings division. Mr. Brierly will make his headquarters in Worcester, Mass.

Ralph P. LaPorte, formerly a member of the executive staff of the Edward G. Budd Mfg. Co., Philadelphia, and well known in the manufacturing contacts of that organization, has been appointed manager of manufacture of the International Heater Co., Utica, N. Y.

Foundry Course Trains French Foundrymen

The course for foundry foremen and supervisors organized in France under the patronage of the Union des Industries Metallurgiques, Mecaniques et Minieres, ended June 17 at the high School of Foundry.

This course, which extends over a period of 2 years, includes 104 lectures, two lectures being given each week. Part of the lectures deal with theoretical notions which are indispensable to the foreman and supervisor, while the remainder relates to actual practice.

An example of the interest which this course has created among French foundrymen is the case of one man who twice a week has travelled from Pompey to Paris, a distance of about 175 miles, spending parts of two nights each week in the train. E. V. Ronceray is the director of the course.

For Old Friends

A NUMBER of special copies of the four page section appearing as pages 19 to 22 in this issue have been preserved, unbound, for old time readers and subscribers to The Foundry. A copy will be sent, without charge, to each individual or firm making a request. The Foundry will be glad to hear from old friends.

Reader's Comment

Interesting communications from readers of The Foundry

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or of Its Editors.*

Taken for Granted

TO THE EDITORS:

At first glance it would appear that David McLain, in his letter in the August issue of THE FOUNDRY considers E. R. Young and myself guilty of a culpable suppression of facts, as the result of which we had created a false impression. Careful re-reading of his letter shows that no "grave situation" has been brought about, but rather that he, his engineer—friend, and we are substantially in accord. Your correspondent describes himself and his engineer-friend as old timers; the present writer ventures also to claim enrollment in that catagory.

It is beyond cavil that the correct mixture of steel scrap with the iron charge of the cupola vastly improves its product. And to no one can more praise be given for the industrialization of that fact than to Mr. McLain. It is safe to say that the fact is recognized, and made industrial use of, by practically all foundries making high test iron in the cupola.

It must be remembered that steel scrap in its passage through the cupola becomes carburized to a point far exceeding that of those iron-carbon alloys conventionally listed as steels, although lower than that of the cast iron or pig charge itself; in other words, synthetic pig, low in carbon and very low in silicon, would be the practical form of its resultant. Hence the writer perhaps pedantically prefers calling the cupola product in question *steel-mix iron* rather than *semi-steel* which as a matter of fact is not always *semi* and never is *steel*.

But whatever be the pros and cons of that purely philological point of argument, the outstanding factor remains that the net result should be, and with any reasonable care is, the lowering of the total carbon content of the melted cupola iron in accordance with final carbon differentials which should pertain in the metals charged, when steel is used. So many working factors creep into the matter that the exact differential is not ordinarily capable of a simple numerical statement. Generally speaking, in first class cupola operation the carburization point of the added steel may be said to lie in the rough order of 2½ per cent where the iron is withdrawn continuously to ladle or fore-hearth; it may exceed this quite considerably if the molten iron is allowed to lie in contact with the coke above it.

In electric-furnace or air-furnace melting the total carbon reduction as the result of steel addition differs of course in this respect, in that the carbon reduction of the bath is mathematically proportional, from a practical point of view, to the carbon contents of the metals charged; in fact carbon often is added to a high steel mix iron so prepared, as well as silicon.

Since our paper was presented to a body of foundrymen of a high degree of intelligence who obviously would be thoroughly conversant with the above facts, we naturally did not stress the question of steel additions to the cupola charge, rather taking it for granted. But we did stress the importance of using molybdenum with a good base iron to get the best results.

Quoting from the excellent international paper presented by R. S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee, to the Institute of British Foundrymen in June of this year, he says that "low carbon iron is the prime requisite of high test iron."

Mr. McLain's engineer-friend in the letter under discussion points out that "the best castings which they have received were made from a 50-50 steel mixture with a percentage of molybdenum included, and were billed as semisteel," thus making our mutual agreement complete. The predilections of a shipping clerk in the matter of nomenclature hardly should figure here; a true invoice description of the castings would naturally be found in the phrase "molybdenum steel-mix-iron castings."

The excellent micrographs of Fig. 1 accompanying the letter in the August issue may not be in line with our own idea of focussing graphite, as expressed in detail in the paper of Mr. Young and myself. But I think that anyone comparing Fig. 1 with the lower half of our Fig. 1 in the July issue (taken at a similar focus) will be shown the difference of graphite formation and dispersal which we accentuated.

In the improvement of cast-iron by the incorporation of steel scrap Mr. McLain has indeed done yeoman service, and for it I for one am deeply grateful to him. His work has helped to provide the alloy foundryman with an ideal base on which to build, and the inexorable forward movement of the hands of the clock of progress makes it increasingly evident that the base cannot be too good. The alloy iron metallurgist has then a real opportunity for the development of his branch of the art.

J. KENTSMITH
Climax-Molybdenum Corp.
Detroit

Spends More Time

TO THE EDITORS:

You certainly showed good judgment in giving THE FOUNDRY not only a new suit of clothes but even the reading material, which has always been good, has taken on a new life and the new arrangement is most attractive. I spend more time on your one issue than I used to on both of them before, much to my benefit.

You certainly deserve all of the favorable comments that you have been printing as they are received from your various friends.

WM J. GREDE
Spring City Foundry Co.
Waukesha, Wis.

Likes It Better

TO THE EDITORS:

THE FOUNDRY as a monthly has come to hand, and we like it, even a little better than the semimonthly issues, which we have always appreciated.

HENRY H. WILSON
Wilson "Waratah" Metal Co. Ltd.
Norman Park
Brisbane, Australia

Ignorance of Conditions

TO THE EDITOR:

The letter in the August issue of THE FOUNDRY under the title "Expensive Economy" points to a few facts of interest in modern operation.

Foundry A's trouble recalls an experience with a marine propeller cast on a rush order. A scrap casting resulted due to two reasons: First, the pitch surface (swept up in loam) was finished before the higher wall had been settled by drying and when the surface was settled the higher part dropped, due to baking, and lost pitch. Second, the cope parts were removed to accelerate cooling of the casting; as a result the upper surface of the blades was exposed and caused distortion of the casting with a loss in pitch of 6 inches on 18 feet. A 3-ton propeller was rejected as a result.

The practice of dumping castings before they are reasonably cooled is the direct cause of distortion due to local cooling and is evident during machine operations and later in a finished product to no small degree.

Foundry B is the usual result where we find young *cubs*, usually

ALBANY SAND

CAREFULLY GRADED

LABORATORY TESTED

Dependable!

Our product, graded and selected for the work required, meets the requirements of discriminating Foundrymen.

We Guarantee Every Car

Albany Sand & Supply Co.

Albany, N. Y.

Producer and Shipper of The World's Best Molding Sand

sales engineers, with a superabundance of ignorance as to actual conditions and recognized practice. The technical graduate with no actual experience as to foundry conditions and little of general practice in engineering is responsible for failure in too many instances. He has wild ideas of his importance in industry, and usually finds his level, "Selling" what he has failed to produce due to lack of experience.

Foundry C, with a simple job of loam, failed to make the casting due to the use of hard brick in the core and loam with no vent producing material. This is just another instance of where one picks up a trade instead of learning all the essentials where things are produced.

While on the subject of venting the writer recalls an automobile cylinder design that was sent 88 miles with a rush order for pattern and sample casting and no provision for venting, supporting, or removing the water jacket core. Why was this possible? Too many cubs.

The usual automobile cylinder block is the most unreasonable of designs from any angle. After it is finished it is subjected to every conceivable casting *strain*. First those that are due to brutal foundry practice at all points; second, lack of uniformity in structure and inherent temperature variations in service. A superintendent says "The art of gray iron founding is degenerating." Why, I asked? Is it not the desire for output regardless of quality and the elimination of those who are qualified by experience for those who have not?

I recall an experience in the Cleveland district. An efficient scrap factory was operating. The foundry basement was loaded up with automobile engine castings that had been sent 450 to 700 miles to be rejected and returned. The castings were being seasoned to eliminate chilled areas. Haphazard methods as to metal control, design and the use of chills to prevent porosity were the causes. Thin walled pistons were cast with hard cores and metal that was chilled readily. The open ends were like flint as to hardness.

The practice now is to rough machine castings and test for leaks and porosity, this saving freight and the return of scrap castings.

When a concern has no head to direct and no tail to steer and finds its true level there is a reason. It is natural to fail—"*inefficiently managed foundries*" is right.

ONE WHO KNOWS

Has New Building On Wisconsin Campus

During the summer, the department of mining and metallurgy, University of Wisconsin, Madison, Wis., moved into its new building located on what is to be the new engineering campus. The new building is of fire-proof construction and contains about 28,000 square feet of laboratory floor space. The first floor contains a crushing and screening room, ore dressing room, the ceramics department, and physical testing apparatus. A lecture room is included in the central section of the building. A large physical metallurgical laboratory containing various furnaces and accessory apparatus is located on one end of the building and on the other a similar laboratory houses the larger furnaces for class demonstration.

Various physical and chemical laboratories, a lecture room and the faculty offices are located on the second floor. The central section contains a temperature standards laboratory, a pyrometer laboratory and a suite of three rooms for microscopic examination of metals. A large lecture auditorium, museum, and offices are arranged on one end of the building and three large lecture rooms and the chemical laboratory for class demonstration in industrial practice is provided on the other. Increased facilities, which this building will afford the department of mining and metallurgy, will provide a greater service to the industry of the state.

New home for mining and metallurgical students at the University of Wisconsin

Book Review

Heat Treatment and Annealing of Aluminum and Its Alloys, by N. F. Budgen, cloth, 341 pages, 6 x 9½ inches, published by Chapman & Hall Ltd., London, England, and supplied by THE FOUNDRY, Cleveland, and in London by the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster.

While considerable information on the heat treatment and annealing of aluminum and its alloys has been published in technical literature, and several textbooks on aluminum metallurgy contain chapters on those subjects, this is the first comprehensive book devoted heat treatment and annealing of aluminum and its alloys. The author, who is associated with Wm. Mill's Aluminum Foundries, Birmingham, England, eminently is qualified to discuss the subject of heat treatment and annealing of aluminum. While presenting results of his own experience, he has not neglected to include data and results obtained by other investigators.

The book is divided into four parts with six appendices and an extensive bibliography. The first part deals with heat treatment of wrought pure commercial aluminum to increase strength and to soften or anneal. The second part presents information on heat treatment of cast pure commercial aluminum for increasing strength and to obtain softness. The third part is devoted to heat treatment of wrought aluminum alloys while the fourth part describes the heat treatment of cast aluminum alloys. Appendices deal with making of hardeners, influence of heat treatment on corrosion embrittlement, mechanical properties of aluminum and its alloys at elevated and low temperatures, effect of gas content, methods of marking heat treated aluminum and aluminum bronze.

Handles Magnetic Equipment in Texas

C. G. Unlaub, 1712 Carter street, Dallas, has been appointed representative of the Magnetic Mfg. Co., Milwaukee, in the Dallas, Texas territory. Mr. Unlaub will handle the entire line, which includes separators, clutches, conveyor rolls and other magnetic equipment.

Industrial plants have reduced employe injury frequency rates 39 per cent in two years; severity rates, 19 per cent in two years according to the National Safety council.

ALL WRONG
Ladle in front trousers over leggings -- no goggles--- no fender on ladle
PROTECT YOURSELF
Carry ladle in back-note leggings-goggles and fender

Safety in Foundry Operations

Use of proper protective devices reduces injuries and lost time due to accidents

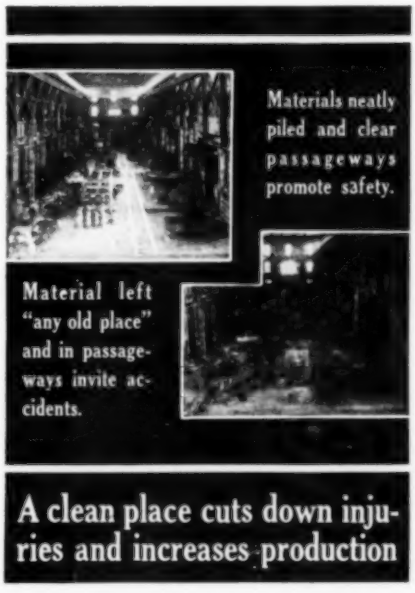
By T. A. SCHENDEL
Caterpillar Tractor Co.

TO THE man in accident prevention work, it would seem that the National Safety council safe practice pamphlet No. 73, *Safety in Foundries*, covers the subject in such a comprehensive way as to leave small margin for anyone attempting to write on the same subject.

From the smallest to the largest, a foundry is like any other plant, subject to hazards, peculiar to its own line of manufacture, and like most plants offers a wide variance of conditions, operations, and possibilities for accidents that present themselves to those responsible for the safety of its employes.

Unlike a machine shop, where highly specialized machinery takes away to a large extent the element of hand operation, the foundry requires a great deal of hand labor and requires for the most part men familiar with a number of phases of the industry. Therefore these men must be picked both for past experience and for that peculiar ability to go about their work with precision and due respect for the work they are doing, and for the trickeries and vagaries of hot iron.

To assist the worker in his efforts to work safely proper equipment must be the first order of business. A part at least of the various items placed and subject to supervision by the man or men responsible for safety are discussed in the following


Materials neatly piled and clear passageways promote safety.
Material left "any old place" and in passageways invite accidents.
A clean place cuts down injuries and increases production

Eye protection in the modern foundry becomes easily the first item. Goggles, as they are offered today, are a great step forward from the earlier, poor fit, cloudy, fragile glass and uncomfortable headache producers of a few years ago. The worker today knows and wants the best in eye protection. He should be given a lens that has proved by proper tests to be able to resist impact of flying pieces of iron, steel and molten metal. He should have this lens in a frame suited for the work he is engaged in. If eye-cup, it should be one constructed with respect to ventilation to get away from the old *fogging* objection. Spectacles densed in the proper shade of color and framed in an easy fitting fibre frame will provide a popular and well-used protection for many jobs where heat and glare enter into the subject.

Any man at all exposed to a flying particle hazard and wearing corrective glasses of his own should be equipped with this same correction in a shatter proof, or safety lens, as a precaution against the break-

ing of a lens in his face, making a bad eye injury. In some cases, employers furnish these to such men as require them without cost to the man. The newer types of easy adjustments, wider vision, eye cup goggles, make ideal protection for chippers, grinders, inspectors, and general cleaning room workers.

The subject of eye protection cannot possibly be covered in these short paragraphs but can be summed up in this way: There is a form of eye protection available for every job; provide it and insist on its use.

Foot protection has been an established custom in every modern foundry for some time and with the many safety shoes on the market, no one should have trouble in getting shoes that the employe will wear. Insist on their use and make it easy for the man to buy them through any organization or facility you may have in your plant.

Protect Legs and Hands

Leg protection has advanced greatly to the point where you can equip your men with comfortable, easy on and off legging both in knee and hip length. Hand pads, mitts, etc., are in demand on a good many jobs where hot castings, rough edges, etc. make the job a hazard for burns, scratches, and infections. Experiences and needs will be the guide in issuing these pieces of equipment.

Suitable goggles, hand pads, and split leg fire-proof aprons (with a good bib) are a needed protection for cupola tenders. Safety shoes and hand pads should be part of the equipment of the charging floor attendants.

Substantial rails with removable gates are a needed safeguard in front of all tumbling barrels and where the plant layout permits these rails should be so placed that barrels are completely enclosed when in motion.

Sandblast operations call for special safe-guards in line with the extent of the operations. As a rule, the manufacturers of sandblast equipment include the best type of operator's helmet, etc., with their equipment, such as a helmet circulating air from outside in and through the helmet, and providing proper eye and face protection, all of which should be supplemented with heavy aprons and gloves and safety shoes.

Suitable, portable screens between workers in cleaning and chipping departments eliminate to a large extent the dangers due to flying pieces, and afford protection for those using the aisles nearby.

In every foundry, the employe is exposed to overhead hazards: Cranes carrying castings, ladles, flasks, core sand, yard cranes for scrap, sand and pig iron. All have their own individual hazards of operation and call for the best type of operation, maintenance and inspection. A rigid program of inspection of all working parts, runways, cables, etc., on all cranes and monorail systems should be maintained and inspection reports given preferred attention by proper people having that work in hand. Hoisting chains and cables, hooks, etc., need rigid supervision because of the almost constant use over the heads of workers. Whenever possible hand holds should be provided on hooks to avoid man having a hand caught between hook and lift. Operators should be picked for experience and given good practical tests under a master crane inspector before being turned over to the operating departments concerned. Good, well-maintained equipment suitable warning devices, seasoned careful operators, take care of that phase of foundry safety.

Good foundry *housekeeping* is as much a part of the modern foundry as any recent improvement of speed production. A foundry today can be as clean as any other shop, windows should be cleaned regularly, clean-up gangs can and should be taught to give the foundry a thorough going-over after each day's production. Orderly piling, well-cleaned floors with tools, bars, etc., all in their proper racks up out of the way, aisles open—all are a part of the story of proper foundry housekeeping.

In a good many foundries, it is the practice to depend a great deal on warning and danger signs as a means of impressing the need of special caution. It is the author's opinion that a great many of these are confusing and that it is far better to eliminate the hazard or guard it as well as possible, rather than merely placard it.

The pattern shop in connection with most foundries is a unit by itself and has its own safety problems which lend themselves to the same treatment as any wood and metal-working shop. Patternmakers are considered highly skilled workmen and respond readily to safety with the result that usually such departments have creditable safety records.

Research Group Opens New Laboratories

The British Cast Iron Research association, Birmingham, England, recently opened its new laboratories and offices at 21-23 St. Paul's square, where much more room is available in which to carry on the work of that group. The ground floor of the building provides for the library and information bureau, general office and offices of the director and senior metallurgist, research laboratory for physical metallurgy, development laboratory, machine shop and mechanical testing laboratory and melting shop. The metallurgical and chemical laboratories are located on the third floor.

The library and information bureau contains an exceptionally large collection of the world's literature relating to the foundry industry. It comprises about 1000 volumes including books, bound volumes of scientific, trade and business publication, transactions of societies, technical pamphlets, trade catalogs, patent specifications and other publications and is shown in Fig. 1.

Official opening of the laboratory was in charge of Sir Harold Hartley, president of the association, and was performed by Lord Rutherford of Nelson.

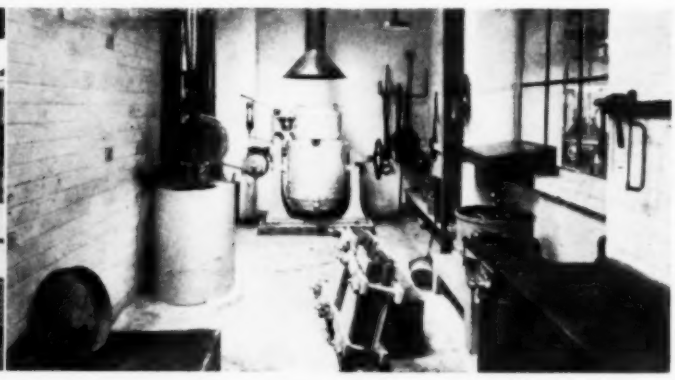


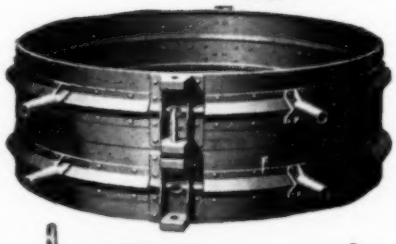
Fig. 1—(Left)—The library and information bureau contains in excess of 1000 volumes. Fig. 2—(Right)—Part of the equipment employed in the melting department

ACCEPT NO SUBSTITUTE

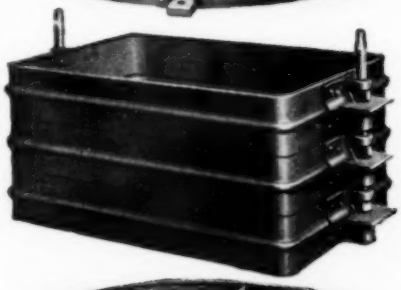
Sterling

Style "BLT" with combination double lug pinholders and trunnions — also built in single combination.

Style "K" a popular type for machine moulding.



Style "BL" the best flask for circular work, 18 to 48 inch diameters.



Style "A" an excellent type for general work.

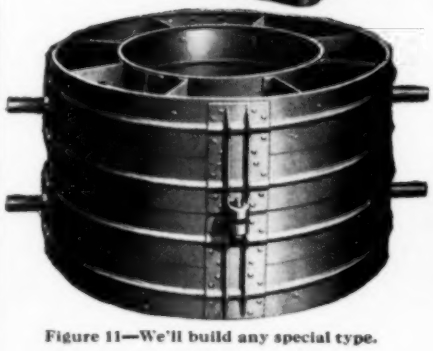


Figure 11—We'll build any special type.

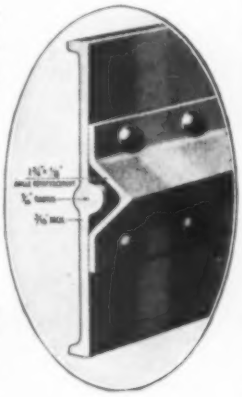
Sterling "Rolled Steel" Flasks in terms of dollar purchasing value—mean:

1 50% lighter than cast iron—easier handling and more moulds per day per man.

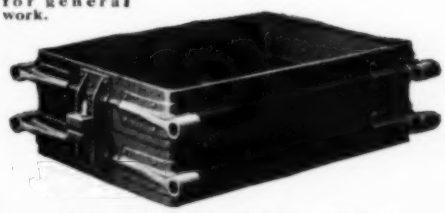
2 All sizes, shapes and styles—for bench, floor, or machine moulding of any metal—saving in sand and floor space.

3 Can't burn — can't break — can't twist. Lasting longer under terrific abuse of machine moulding. Always level at the partings.

4 Increased production—cutting labor, time and effort—costing less per hour of use.



It is in these 4 fundamentals that Sterling "Rolled Steel" Flasks set today's modern economic standard.



Style "GGR" light floor or medium machine moulding.

An achievement only possible thru Sterling's exclusive engineering feature of "Rolled Steel" construction (see illustration above) which guarantees the utmost strength, rigidity, accuracy, and light weight at all times.

Figure 8—One of the many odd shapes.

Style "LL" extra reinforced for roughest usage.

STERLING WHEELBARROW COMPANY

STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

MILWAUKEE WISCONSIN

BRANCH WAREHOUSES—BOSTON, NEW YORK, PHILADELPHIA, PITTSBURGH, CLEVELAND, DETROIT, CHICAGO, ST. LOUIS

Prevent Losses with

Proper Gates and Risers

By PAT DWYER

MANY factors must be taken into consideration when arranging a group of patterns in a drag or on a pattern plate. A certain factor which arbitrarily might limit choice of position in some instances might not be of any consequence in others. In many instances patterns and gates are arranged on a pattern plate in accordance with the best judgment of men who have arrived at their decision through knowledge born of actual experience. In other instances the arrangement simply represents the personal preference of the patternmaker, who may or may not be qualified to decide such an important point.

Many small brass castings are poured while the mold is in an inclined position and in these cases the direction in which the castings point toward the central runner is an important factor. Some molds are filled through a sprue located at the highest point, while others are filled through a sprue located at the lowest point. In either instance and in the majority of cases, the most advantageous position in which to lay out patterns and gates is shown in Fig. 170.

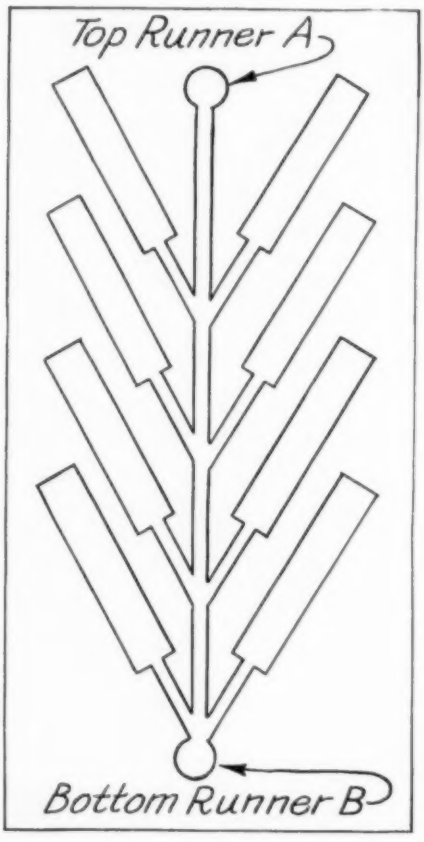


Fig. 170—Where the mold is tilted the sprue may be at the high end A or at the low end B

Arrange Patterns

ONE of the most important features in connection with the production of nonferrous castings, especially those that have to withstand pressure, or those that subsequently are polished, is the position which the patterns occupy in the flask in relation to the position of the gates and runner. Improperly placed gates will drain metal from the castings instead of carrying out their natural function of supplying metal to compensate for the shrinkage which takes place while the metal in the castings is solidifying. Gates for polished castings must be designed to catch and hold any foreign material that inadvertently may fall from the lip of the pot, or wash from the sprue or runner.

In event that the mold is raised at the end marked *A* and metal is poured into a sprue at that end, it will run first to the lowest point of the runner and then gradually back up and in that manner fill the individual molds gently from the bottom. If the mold was elevated and the metal poured at the opposite or *B* end so that patterns pointed down instead of up, a little metal might be deflected from the main stream and enter the higher molds. By the time the main stream backed up after filling the lower molds, this deflected metal would be in a solid state and the new metal would not unite with it.

Manifestly if the mold is elevated at the *A* end as in the first instance, and gated at the *B* end, the general effect will be the same. The lowest molds will have to fill before metal travels any higher in the central runner. If patterns were pointed in the opposite direction, that is like so many back pockets into which the metal would have to fall on its journey past, some of the molds would not fill properly.

Certain factors may or may not affect the position of patterns and gates where the molds are designed to be poured while in horizontal position. The inclined mold gives the foundryman no choice. Where molds are poured on an incline, patterns should be arranged in such a manner that metal surely will enter the lowest molds first and the others in proper succession.

In all the foregoing instances gates and runners must be designed and arranged in such a manner that they will not act as suckers instead of feeders. The well known alloy 85 per cent copper, and 5 per cent each lead, tin and zinc, is used successfully even for

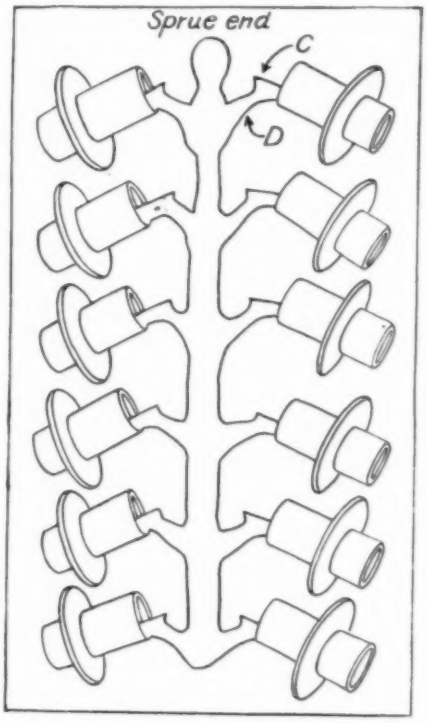


Fig. 171—The metal flows down into each mold cavity and will not leak back

pressure castings by some foundrymen, while others produce many leaking castings. In some instances this is due to arrangement of gates and runners, while in others it is due to design of patterns. In nearly all cases leakage can be stopped by increasing the lead content to a maximum of 8.00 per cent.

Where trouble is experienced through a high percentage of leakers, the manner in which patterns are laid out and gated and especially the position in which they are poured should be studied carefully. Broadly speaking the mold cavities should resemble a bag into which the metal may flow readily, but from which it cannot es-

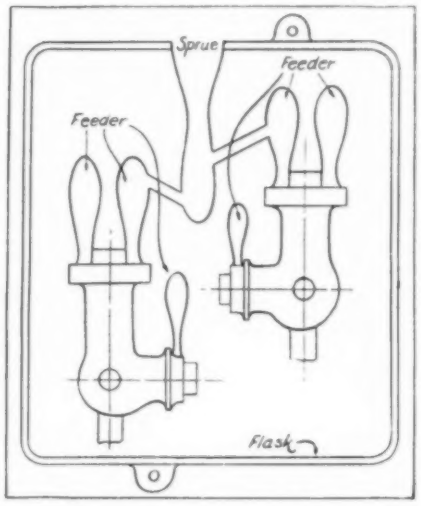


Fig. 172—French method of gating castings in a vertical position

cape. An example of this arrangement is shown in Fig. 171. That part of the gate marked *D* will feed the runner, but before this stage of solidification has been reached, the passage at *C* is closed. These castings will not leak, at least not through metal seepage to the runner.

A method of molding valves in a French foundry is shown in Fig. 172. The method is perfect so far as production of good castings is concerned, but the time element is sufficient to condemn it in the eyes of foundrymen accustomed to rapid operation. In this particular instance according to the representative of the American molding machine manufacturer who supplied the machines, the production of two machines, one on the copes and one on the drags is 60 molds in 20 working hours. The greater part of the time—17 hours—is occupied in finishing and closing the molds.

Both halves of the mold are made on stripping plate jolt machines. The sand is rammed as hard as possible, by giving it 150 jolts and then butting the top with a heavy rammer. The face of each mold is washed with a compound of claywash and blue powder mined locally. The molds are dried in an oven over night and on the following day are clamped in groups of four and turned up on their side for pouring. The mold cavities thus are in a vertical position as shown in Fig. 172. Exceptionally fine, solid castings are obtained by this process. Incidentally the mixture for these castings included: Copper 90 per cent, tin 8 per cent and zinc 2 per cent. With no desire to institute invidious comparison, it is entirely probable that these castings could be made satisfactorily in green sand, and in greatly increased numbers, if gated in the manner illustrated in Fig. 171.

Increase Size of Runner

Skimping the amount of metal in the sprues and gates is not an economic policy. This does not necessarily mean that the sprue and gates should exceed reasonable proportions. In many instances position of the pattern in the mold must be taken into consideration when deciding on size of the gates and sprues. Where a small gate might serve in one position, a much larger gate is required when the position of the pattern is changed. Many reasons exist for molding certain castings in certain positions irrespective of the style of gate involved.

In this connection it is interesting to note that many minor defects in castings may be traced to the style, the cross sectional area or the height of metal in the gates and sprue. A slight change in one of these features frequently is all that is required to banish the defect. Consider a typical instance to illustrate this point:

A foundryman was experiencing considerable trouble from defects in a small funnel shaped casting shown in Fig. 173. These defects could not be detected until the castings were partly machined. Some of these castings were poured from a good grade of yellow brass, while others were poured from a red brass mixture.

Apparently the defects were not due to either melting or molding practice since they only appeared in isolated parts of the castings. In the yellow brass they resembled worm holes in wood, while in the red brass they usually appeared as discolored specks.

Investigation of this problem indicated that the volume of metal in the gate was not quite adequate to compensate for liquid shrinkage in the castings. When the size of the runner was increased the trouble disappeared.

These castings were molded as shown in Fig. 173 with the large end of the funnel up, that is toward the cope. The funnel cavity was formed by the cone shaped green sand core suspended from the face of the cope. Obviously this is the easiest and most convenient position in which to mold these castings. They could be molded in an inverted position, with the entire mold cavity in the cope, but that would involve the use of a deeper cope and a much higher sprue.

Molded and gated as shown in Fig. 173 the funnel part of the casting served as a feeder for the stem. This is normal procedure and would have resulted in no defect if the gate had fed the upper part of the casting to compensate for the shrinkage of the stem. Unfortunately the gate was too small and the metal therein set before its mission was complete. The illustration simply is a cross sectional view of one pair of castings. As a matter of fact the flask contained two rows of castings fed from a central runner and single sprue as shown.

After the mold was filled, the metal in runner and gates solidified before

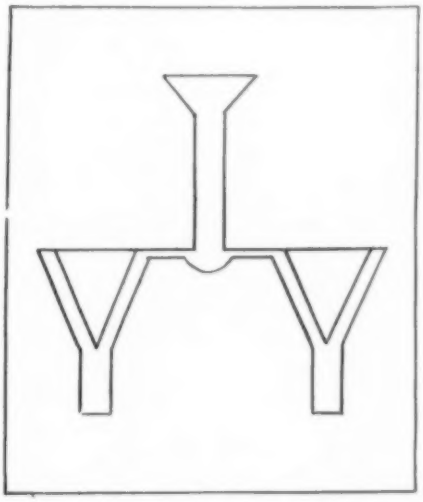


Fig. 173—A gate at the top edge insures feeding metal in the heavy stem of the funnel casting

the metal in the castings, hence the shrinkage defects. The remedy adopted, a remedy that may be applied to advantage in many instances, was to double the cross sectional area of the runner. The increased amount of metal in the enlarged runner served as a reservoir or feeder to the gates leading to the various mold cavities.

In this instance with the entire mold cavity below the flask joint line, the slight change in the size of the runner was sufficient to eliminate small shrinkage defects. Had the mold cavities projected into the cope, the height of the sprue would have to be raised to correspond. With a different type of casting it might be necessary to increase the area of the gates.

Dull metal frequently is responsible for misrun castings even when the gates are ample in size and properly located. In instances of that kind the furnace practice should be investigated and proper methods installed to secure satisfactory metal.

Reference to melting practice is outside the scope of the present series of articles on gating castings. However, the two subjects are closely related. For further information on the subject of furnaces, fuels, melting practice, proper melting and pouring tempera-

tures, the student is referred to the files of THE FOUNDRY, *Transactions* of the American Foundrymen's association, *The Foundrymen's Handbook*, published by the Penton Publishing Co., and other technical publications.

Manufacturers of crucibles and melting furnaces have compiled a mass of interesting and useful data on the care and operation of their equipment. This information should be secured and studied by all who are responsible for the production of molten metal suitable to be poured into molds.

By careful study of existing and available information the young and comparatively inexperienced nonferrous foundryman can approximate results secured by men who have reached their present eminence through a long, slow period of practical experience and observation, based principally on cut and try methods. A reliable pyrometer will indicate the correct temperature of the metal irrespective of whether the metal is in the shade or exposed to direct sunlight, or whether the shop is dark or artificially lighted. Features which sometimes cause the most highly trained human eye to err.

Basin cocks may be taken as a typical example of a wide class of castings known as plumbers supplies where defective castings may be traced as frequently to dull metal as to improper gating and pouring methods. This is particularly true where the metal is a low grade yellow brass lacking in fluidity at a temperature where a better grade of material would flow freely.

Choke the Gates

These castings usually are molded five to a gate in a flask 12 x 18 inches. In modern practice a squeezer molding machine is employed and the sand is just packed hard enough to prevent swells and dropouts. A fairly open sand is employed for the molds and the cores are made of a fine sharp sand bonded with oil. The runner is ½ x ¾-inch and the sprue 1½ inches diameter is located close to one end of the flask. Where the molds are tilted, the sprue is placed at the lower end. The gate should be placed close to the spout end of the casting where the metal is thin. Preferably the runner should be placed in the cope. A runner entirely in the drag will have a tendency to bleed the casting and thus produce leakers.

Usually in gating yellow or red brass, it is advisable to use a runner that extends into both cope and drag, two-thirds in the cope and one-third in the drag. The gates are choked at the entrance to the mold cavity and also should be placed partly in the cope and partly in the drag. This arrangement allows the sprue head to be filled when pouring commences. This practice is almost mandatory with yellow brass.

The comparatively thin section of gate at the choke is kept open by the mass of metal in the gates and runner and by the metal in the casting and thus the casting is fed adequately.

Yellow brass in the furnace should be hot enough to flare strongly. In the crucible at the mold side it should flare strongly when disturbed by the skimmer. It should be poured as near this temperature as possible.

Another type of defect sometimes found on small flat brass castings may be traced to the gates. After these castings are buffed, small scratches appear on the surface. Under magnification these scratches show tiny lumps of some hard substance.

Castings To Be Polished

This form of defect is caused entirely by the manner in which the patterns are arranged in relation to the gates. Patterns are placed at the end of gates which jut straight out from the runner. This is an unsatisfactory manner in which to gate thin brass castings that are to be polished.

Another contributory error in cases of this kind is to place the sprue in the center of the runner after the fashion usually practiced in gray iron foundries. The result is that some of the castings receive some foreign material at the first dip of the pot. One remedy is to move the patterns, especially those near the sprue, further away from the runner. The other remedy is to use a crooked instead of a straight gate.

In some instances the foreign material that spoils the appearance of the castings is nothing more nor less than sand washed from the sprue. An examination of the metal in the sprue after it has been cleaned will indicate if this factor is responsible for the trouble. The remedy in cases of that kind is obvious.

Assuming that the sand is not disturbed in the sprue, the runner or the gates and the defect is caused by a small amount of foreign material that inadvertently falls from the lip of the pot, precaution should be taken by designing and applying a gate that will catch the dirt on its journey and prevent it from entering the mold cavity.

This feature, a clean mold for a clean casting, has been stressed before in this series, but it cannot be reiterated too often.

This is the thirty-third of a series of articles dealing with the various types of gates and risers used in the foundry industry. The thirty-fourth installment will appear in an early issue.

THE EDITORS

Recent specifications of the Federal specifications board, Washington, governing purchases of all department and independent establishments of the government, include QQ-S-681 covering steel castings and WW-U-536 covering malleable iron or steel unions. Copies may be obtained from the superintendent of documents, Washington for 5 cents each.

Malleable Problems Considered by A. S. T. M.

Committee on malleable iron castings, American Society for Testing Materials, now is studying the cause of galvanizing embrittlement in malleable iron castings, through a subcommittee under the direction of Enrique Touceda. The study is being conducted with the idea of securing a better understanding of the cause and cures of such embrittlement.

A specification for malleable iron castings suitable for pipe fittings, valves and valve parts is being developed and considerable progress is reported by a subgroup in charge. Interest also has developed in the corrosion-resisting properties of malleable iron, especially for overhead trolley construction. That subject is being given further study by a subcommittee and data now being developed promises interesting results.

Officers of the committee on malleable iron castings are as follows: Chairman, W. P. Putnam, Detroit Testing Laboratory, Detroit; secretary, Enrique Touceda, Touceda Chemical & Physical Laboratories, Albany, N. Y.

Plan Publication of Cast Metals Handbook

Final preparation of a cast metals handbook, now being sponsored by the American Foundrymen's association, has been placed under supervision of a special joint committee under chairmanship of T. S. Hammond, Whiting Corp., Harvey, Ill., as president of the A. F. A. This committee consists of eleven members, including representatives of the A. F. A., Gray Iron institute, Malleable Iron Research institute, and the Steel Founders' Society of America.

Preparation of a cast metals handbook first was recommended by the joint committee on foundry education in engineering schools in its review of the need for general education relating to cast metals. The purpose of such a handbook, it was stated, would be to supply engineers and users of castings with reliable data on the properties of cast metals. Collection of material to prepare the book then was begun under auspices of the education committee on which serve representatives of the previously named organziations and the National Founders' association and Foundry Equipment Manufacturers' association.

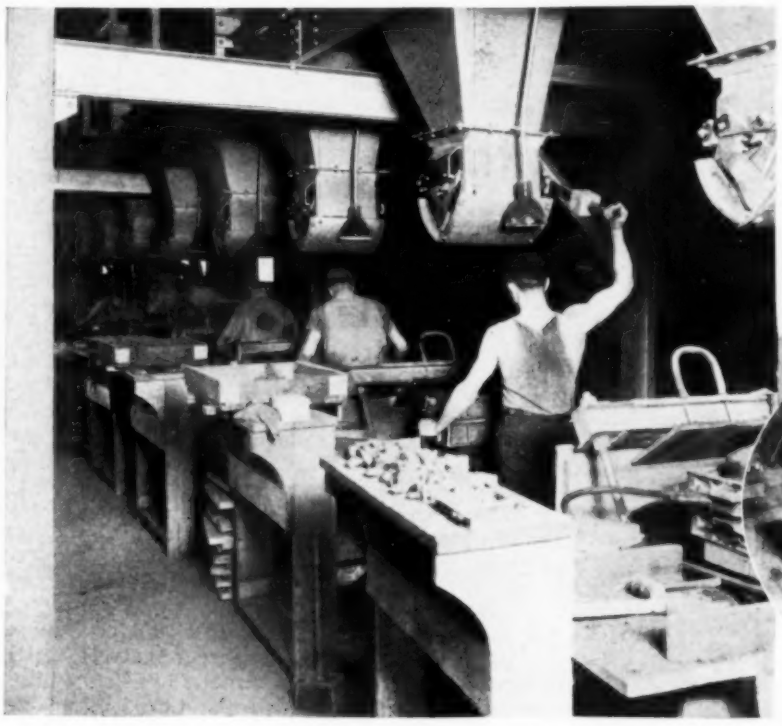
The first meeting of the new joint committee, to be known as the joint committee on cast metals handbook, was held in Chicago, recently at

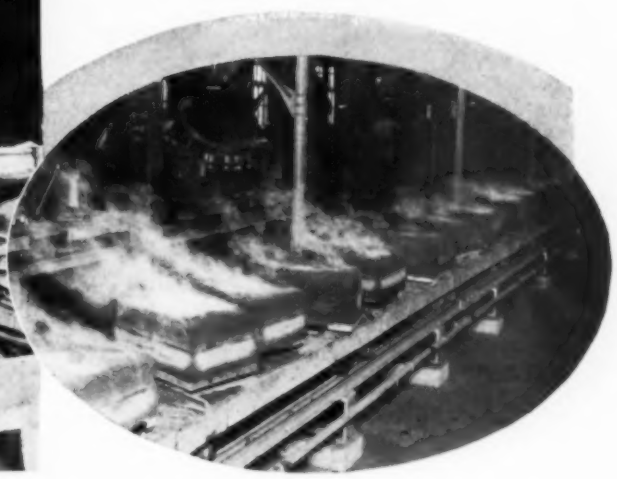
(*Concluded on page 50*)

FOUNDRY EQUIPMENT

ENGINEERED

FOR THE HIGHEST FOUNDRY EFFICIENCY





Lower Prices *Must* be Met With Lower Costs

After every lull in business, the big rewards in growth and profits go to those who have taken the opportunity to prepare for the approaching period of business activity.

Today, with casting prices at low levels, foundries should heed this lesson. Business increases will come . . . and profits will have to be made at these lower price levels. For the foundry that faces these facts, there can be but one conclusion . . . castings must be produced at lower costs.

The way to lower costs is not the same in every foundry. But there are certain operations, common to all foundries, where up-to-date methods mean sure savings.

Take material handling operations, for instance. Under old-fashioned, manual methods they are responsible for the major share of total foundry costs. Yet in this field, modern handling equipment, engineered by Bartlett & Snow, has proved itself capable of establishing materially lower costs in foundries of every type. Continuous mold conveyors, mechanical sand handling and conditioning equipment or simple conveyors for handling molds and castings . . . one or all of these may be the answer to your cost problem.

Decide now to learn what savings Bartlett & Snow equipment can show in *your* foundry. Write for information.

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(*Concluded from page* 48)
which time a definite objective was approved, as follows

> To present to editors of engineering handbooks, engineers, engineering students and all users of castings, condensed, reliable and up-to-date data on cast metals, these data to be only such as will enable the user to select the material best suited to his purpose and which will give him needed information to co-operate with foundries in obtaining his castings in the most satisfactory manner.

The joint committee also approved adoption of certain general policies to be followed, appointed Robert E. Kennedy editor, and made provision for an editorial committee to handle the task of collaborating and editing material to be included in the handbook. Personnel of the joint committee is as follows: Chairman, T. S. Hammond, Whiting Corp., Harvey, Ill., president, American Foundrymen's association; vice chairman, Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh, vice president, A. F. A.; A. E. Hageboeck, Frank Foundries Corp., Moline, Ill., president, Gray Iron institute; E. E. Griest, Chicago Railway Equipment Co., Chicago, president, Malleable Iron Research institute; Arthur Simonson, Falk Corp., Milwaukee, president, Steel Founders' Society of America; Sam Tour, Lucius Pitkin Inc., New York, chairman A. F. A. nonferrous division; R. A. Bull, director of research, Electric Steel Founders' Research group, Chicago; Fred L. Wolf, Ohio Brass Co., Mansfield, O.; Frank G. Steinebach, THE FOUNDRY, Cleveland, chairman, joint committee on foundry education in engineering schools; H. Bornstein, Deere & Co., Moline, Ill., chairman, A. F. A. gray iron division; C. E. Hoyt, executive secretary, A. F. A., Chicago.

Hold Foundry To Be Responsible For Successful Service of Propellers

NOISE as a negative factor in the successful performance of a ship propeller has been passed upon by a British court of law. Further, the responsibility has been placed upon the foundry making a propeller to compensate for the implied warranty that such a casting would be free from such audible faults.

The British firm, Cammell-Laird & Co., well known for its shipbuilding and iron and steel production activities, ordered two bronze propellers from the Manganese Bronze & Brass Co. Ltd. A contract was made in 1930 covering these two propellers to be made from Parsons manganese bronze and similar in type. They were for two ships then under construction namely the ATHELFOAM and ATHELBEACH.

Propeller Is Noisy

The propellers were completed under inspection which proved them to be in accordance with the purchaser's design, but when applied that which was fitted to the ATHELFOAM proved to be unsatisfactory in that an unusual humming, grinding or knocking noise developed when operating at 83 or 85 revolutions. This noise was decreased at higher speeds. Attempts were made to remedy the condition by removing two inches of metal from the tips of the noisy propeller.

Then the propeller from the ATHELBEACH was transferred to the ATHELFOAM and no noise was encountered.

The chief structural difference between the two vessels was that the ATHELFOAM had a flywheel and its sister ship did not. Both are diesel engine driven, but the order of firing the cylinders of the two engines, the intermediate shaft and flywheel were the main points of difference. By reason of the noise of the ATHELFOAM'S propeller, classification of the vessel was refused by Lloyds.

The foundry then was asked to supply two replacement propellers. The first of these was found to have an objectionable noise, but the second proved to be satisfactory and was accepted.

The shipping company paid for the two that were accepted while the foundry brought counter-suit for the price of the two which were rejected.

Expert testimony was introduced by the purchaser to show that a higher tensile strength and greater elasticity in the metal was found in the propellers which were satisfactory. Wesley Lambert, consulting metallurgist, testified that he had inspected all records of the casting of the four propellers concerned, three fitted in turn to the ATHELFOAM and that used on the ATHELBEACH. The charges, melting conditions and casting temperatures were similar in all cases and the chemical analyses of the metal checked with the specifications and Mr. Lambert could distinguish no difference in metallurgical factors in the four propellers.

The pitch ratio of the noisy propeller was stated to be low and some difference was noted in the edge of the blades. Testimony agreed that the propellers were accurately fitted on the shafts and that no difficulty was experienced in keying the noisy propeller. The actual difference in weight between the propellers was slight and was well within the tolerance of the shipbuilder's specifications.

In entering judgment Justice Roche of the King's Bench division, found in favor of Cammell-Laird & Co., the shipbuilders. While the judge accepted all claims of the foundry that the propellers showed no defects in casting, the blades of the ATHELFOAM propellers were not properly shaped for the purpose and that the purchaser relied upon the foundry's skill and judgment in these matters. He found that there was an implied warranty of the fitness of the propeller for a specific purpose and that this warranty had been broken. He therefore held that the shipbuilding company was entitled to judgment with costs and damages.

The case has been appealed.

Obviously, the point of interest for castings manufacturers is in assuring that no implied warranty other than that specifically carried in the contract should be accepted and a clause covering disavowal of such warranties should be inserted.

Buys Crane Business

Manning, Maxwell & Moore Inc., 100 East Forty-second street, New York, has bought the business of the Box Crane & Hoist Corp., Philadelphia, and will merge it with the Shaw Electric Crane Co., a subsidiary, at the Shaw plant at Muskegon, Mich. The division will be known as the Shaw-Box Crane & Hoist Co. The purchase does not include the land and buildings at Philadelphia. The purpose in acquiring the Box company is to broaden the line of cranes and hoists produced by the Shaw division. The latter has built heavy hoisting units from 5 to 250 tons, specializing in cranes for railways, steel mills, and other heavy-duty purposes. The Box company has been building hand cranes, jib and pillar cranes, powerhouse and ice cranes and hoists from 500 pounds to 20 tons capacity. It appears the merger will give 80 per cent new engineering and only 20 per cent duplication. Box Crane & Hoist Corp. was founded in 1878. F. J. Winterer formerly president of the Box company has been appointed superintendent of Box production of the merged company.

U. S. department of commerce, bureau of mines, has published a general report entitled "Zinc in 1930" by Elmer W. Pehrson. The bulletin may be purchased from the superintendent of documents, Washington, for 5 cents.

Runs One Man Foundry

Down in Old Mobile

Finished with the dogs of war, he turns his hand to the dogs of a more peaceful variety

IS IT not the Psalmist who says that the years of a man's life are three score and ten? Not that it really matters who is responsible for the statement. Readers familiar with the works of David either will confirm or deny the statement. Others, to whom the word score simply is a sporting term indicating the number of points chalked up—or otherwise marked—in a game of skill or endurance, will wonder if life is a kind of a game, thus throwing some slight measure of aspersion on the late Mr. Longfellow's claim that life is real, life is earnest and the grave is not its goal. In the past, members of this class have pointed—with pride—to a weakness in this statement, to wit: If life is not a game why mention such items as goals?

A third class of readers—and they probably constitute a majority—will say "Well what about this here now three score and ten stuff and what has it to do with the guy who runs a one man shop down in old Mobile?"

Makes Works of Art

The point indeed is well taken. The majority always is right. From the days of the Psalmist up to the present, three score and ten years has been regarded as the knocking off age. A man who remains in the harness up to the age of seventy is considered to have done all that reasonably can be expected. He is a candidate for a seat in the chimney corner, a pipe and a mess of what euphonically is known as spoon vittles. However, in deference to the will of the majority, generalities now will cease and attention will be directed to the accompanying photographic reproduction of Robert Smith, perennial molder, now in his eightieth year who conducts a one man foundry in the old southern town of Mobile, Alabama, where he turns out works of art in aluminum. The work keeps him healthy and happy and interested. He finds a ready sale for his wares "An' the siller, forbye, comes in rale handy at times." Bob hails originally from Glesca.

Many a year has slipped away and many a long mile has passed under Bob's rambling feet since he drew his lying time from J. A. Law & Co., Port Dundas, Glasgow and skipped up the gang plank of the old Bolivia with the avowed intention of trying his fortune in the United States. The old tub carried him safely across the ocean in the creditable time of 8 days and landed him in New York on July 4, the anniversary of the nation's independence. Count it coincidence if you will, but he has remained on this side of the ocean ever since and early in his career became a naturalized citizen.

While living in New Orleans his love of flowers—and perhaps adventure—led him to join an expedition in search of orchids in Costa Rica, Guatemala and other Central American countries. The high point of the adventure was reached in Costa Rica when he and 38 other patriotic American citizens were arrested for touching off the government cannon and otherwise boisterously celebrating George Washington's birthday. The American consul had a sweet time straightening out that jam. Bob admits that he (the consul of course) had a certain amount of justification for the rabid prohibition complex he developed later.

Bob worked in Milwaukee, Pittsburgh, Philadelphia and other middle west and eastern towns and cities for a few years before he decided to look around the South. Leaving New York on a ship of the old Cromwell line he arrived in New Orleans 6 days later and had no trouble in finding all the work he wanted in the foundry, mostly sugar mill machinery with rolls up to 30 inches diameter. In later years he saw the size of these rolls gradually increase up to 60 inches. Breakdowns were common. Molders were paid $3.00 a day and double time for overtime.

A reasonable amount of overtime is not so bad, but too much is worse than none and Bob finally quit and went up the river to Cincinnati where he met practically the same condition and the same class of work. Starting on a new hegira he finally wound up in the navy yard in Pensacola, Fla., where he remained until the closing year of the recent war. Under the rules of the department he was honorably discharged in that year at the age of 65. However, through special intervention of Josephus Daniels, secretary of the navy he was kept on duty for an additional year and a half.

Returns to Mobile

Family reasons brought him back to Mobile where he fitted up a small shop for the production of ornamental aluminum figures ranging in size and subject from reproductions of small dolls to a life size figure of a hunting dog.

John Hill of Cincinnati — every foundryman knows John—claims that Bob is just another living example of the old foundry tradition that molders never die. He claims to have known Bob 40 years ago and he is no older now than he was then.

Technical Education

International Congress on Technical Education will be held in Brussels, Belgium, Sept. 26 to 28. The program for the congress has been divided into several sections and will deal with terminology, professional orientation, professional courses, aid to professional men coming from school and industrial probation in the engineers formation.

European Foundry Practice

Digest of recent literature covering various phases of castings manufacture

Hardening Iron

Hardening Cast Iron, by J. E. Hurst, *Foundry Trade Journal*, July 21, 1932.

Gives results of experiments on effect of hardening by oil quenching of specimens of increasing thickness and on determining influence of increasing nickel contents. A group of round bars varying in diameter were used, and results show annealing treatment in all cases had the effect of reducing hardness, even in high nickel content specimens. After the annealing treatment, bars were hardened by quenching in oil from a temperature of 875 degrees Cent. and further hardness determinations made.

In samples containing no nickel, maximum hardness was on the outside surface. With each successive increase in nickel content up to 3 per cent, maximum hardness obtained increased. Increase in nickel from 3 to 4 per cent is not accompanied with any increase in maximum hardness.

Cast iron alloyed with aluminum and chromium has been found most suitable for nitrogen hardening. Nitrogen hardening process is carried out by submitting castings of a suitable alloy composition to action of anhydrous ammonia gas for a given time at a steady temperature of approximately 500 degrees Cent. Castings are allowed to cool down in contact with the ammonia and then are withdrawn.

Corrosion of Metals

Results Obtained in Fight Against Corrosion of Ferrous Metals, (Resultats Obtenus dans la Lutte Contre la Corrosion des Metaux Ferreux), by R. Arzens. *Bulletin* of the Association Technique de Fonderie, Paris, May, 1932.

Various methods of protection are given: Rustless alloys; metallic coatings; coatings with oxides of metallic salts; enameling; paints. The second part describes methods of testing resistance of protective medium. Among the tests specially mentioned is the salt-spray method used by the French committee on the corrosion of aviation materials. In this test the piece is sprayed with a mist of solution of 10 litres of water and 300 grammes of pure sodium chloride. In an accelerated test the piece is immersed in a solution of water, sodium chloride and peroxide of hydrogen. Industrial tests are mentioned, but they are necessarily of long duration. The third part gives comparative results of tests effected by various methods on protection of cast-iron fittings.

Pulverizing Coal

Combustion of Pulverized Coal in Metallurgical Furnaces, by Dr. Peter M. McNair, *Foundry Trade Journal*, London, Aug. 11, 1932.

Modern ideas on the combustion of pulverized coal are discussed briefly under the following headings: (1) Unit against central system of pulverizing; (2) Grinding fineness; (3) Mixing of fuel and air; (4) Preheating coal and air; (5) Rapid ignition; (6) Heat release per unit volume; (7) Bituminous as compared with anthracite coal. Advantages of preheating air is mentioned, but it is pointed out that care must be exercised to prevent the temperature approaching the ignition point of the coal.

Sand Control

Control of Molding Sands, (Controle des Sables de Moulage), by Guy Henon. *La Fonte*, bulletin of the French Bureau of Foundry Research, Paris, April, 1932.

Terms relating to foundry sands are defined; also terms relating to preparation of sands. Various properties of foundry sands are given: Fineness; chemical composition; moisture content; strength; permeability; cleanliness; refractoriness; durability. Testing methods are listed and apparatus, mostly devised by the American Foundrymen's association, is described. An interpretation of various measurements obtained is given.

Influence of Alloys

Application of the Binary and Ternary Diagrams to the Study of the Influence of Sulphur on Steels and Cast Irons (Application des Diagrammes Binaires et Ternaires a l'Etude de l'Influence du Soufre sur les Aciers et les Fontes), by Jean R. Marechal. *La Fonderie Belge*, Liege, May, 1932.

This is the second of two instalments, and deals with influence of silicon, phosphorus, aluminum, nickel, cobalt, zirconium, cerium and titanium on the iron-sulphur combination. This is followed by a study of the influence of oxygen on the binary system FeS-FeO, on the ternary system Fe-FeS-Fe_2O_3, on the binary system MnS-MnO, and on the system FeS-FeO-MnS-MnO.

Making Cupola Charges

A New Method of Calculating Charges by Graphs (Une Nouvelle Methode de Calcul des Charges Par le Procede Graphique), by Ign. T. Miaskowski. Translated from *Przeglad Techniczny*, Warsaw. *La Fonderie Belge*, Liege, May, 1932.

This article describes a graph method for determination of charges of various irons of a known composition to obtain a cast iron containing definite proportions of carbon, silicon and manganese. The method is based on an equilateral triangle, each side of which corresponds respectively to 100 parts of carbon, silicon and manganese. Sides of the triangle are marked in equal divisions from 0 to 100. The point representing an iron of any definite composition can be found inside the triangle, and from this point certain tracings give the proportion of irons, or irons and scrap, of different composition to be mixed in the charge to obtain iron of the required composition.

Centrifugal Molds

Balancing of Molds for Centrifugal Pipe Casting Machines, (L'Equilibrage des Moules a Tuyaux pour les Machines a Couler Centrifuges), by Dr. Walther Saran. *La Revue de Fonderie Moderne*, Paris, June 25, 1932.

It is absolutely essential that molds of a centrifugal pipe casting machine be balanced perfectly to avoid vibration and irregularities during rotation. The article describes a special machine for balancing molds. It is used in a Saar foundry and is manufactured in Germany. The machine indicates defects in balancing and the location of such defects; where the molds should be weighted to obtain even balance and by how much.

These Reports Tell the Story—

"Best wheel we ever had on portable grinders."

"Produced 926 pieces against 720 for best competing wheel."

"Held shape better and removed stock twice as fast as previous wheel."

"Six Norton wheels averaged 12¾ guard rails; the best competing wheel did 9."

Comments such as these—from trial reports—explain well the popularity of Norton wheels for portable grinders. Now, more than ever, lower grinding costs are appreciated.

There are Norton wheels (straight, cup or cone) for grinding all kinds of materials . . . . on high or low speed machines. It will pay you to try these wheels in *your* shop. Write to the nearest Norton office.

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Home is the sailor, home from the sea and the hunter home from the hill

The Adventures of Bill

By PAT DWYER

IF SUCH a thing was possible," I said to Bill, "do you know where I should like to be at this precise identical minute? Wishing won't get me there, but I find that even contemplation of the idea furnishes a certain small measure of relief from the heat wave which—to quote from the inspired reporters—has prostrated our fair city during the past week."

Bill regarded me with a lackluster eye. Plainly he was not interested. He calmly removed the stogie from his lips, flicked the ash from the end with a slight dextrous movement of the little finger and restored the stogie to its original position with the inner end firmly grasped between his teeth and the outer end cocked at a belligerent angle. The modern equivalent of the old knighly motto: "I'm a peaceful guy, but don t tread on the tail of my coat."

Quoting entirely from memory, it is possible that I have two eras mixed, but you get the general idea, ready—and willing—for either peace or war.

"Well," I said, "what about it?"

"What about what?"

"For the benefit of the gentleman who apparently has been in state of coma—suspended physical and mental animation due to the heat—I shall repeat my question. Do you know where—"

"I heard you the first time and the answer is NO. I don't know where you would like to be at the present moment. Since there isn't the slightest chance of having your wish granted, what's the use of talking about it? I could tell you where silly question askers should go, but you probably would not accept the advice, so there y' are, as the feller says, the whole bloomin' kettle o' fish in a nutshell!"

"Your complete and courteous reply to my inquiry of even date is highly appreciated. However, it is no more, and on the other hand it is no less than I expected. Greatly encouraged by the intense interest you display in the subject, I now shall unfold the proposition in detail. I rather imagine it will appeal to you. In fact I shall not be surprised to find you covered with envy, chagrin and—er—one thing or another, because the idea did not occur to you. These flashes of inspiration come only to the mentally alert, to those who keep their eyes open, in a word, to those who are not constantly asleep at the switch. Are you lis'nen'?"

"Oh, for heaven's sake," Bill replied wearily. "Go ahead and spill it before it turns sour on you. However, if your drooling falls on barren ground don't say I did not try to stop you."

He dextrously rolled the stogie from one corner of his mouth to the other, cocked it at even a jauntier angle and slumped down a little deeper in his chair. Going down by the stern, he seemed to say, but the colors still are flying from the main top.

"If I had my wish at the present moment," I said, "I should like to be crossing the harbor ice down home about the middle of January, with snow up to my knees and with a stinging northeast gale whistling in from the broad Atlantic. Well fed, amply clad, bubbling over with reserve energy, every nerve and muscle keyed to concert pitch, I can see myself bounding across that five mile stretch like a whippet after a mechanical rabbit, or a hobo molder after the quitting whistle blew in the wicked old saloon days."

Bill displayed a lamentable lack of enthusiasm, but his crude sense of humor prompted him to view the imaginary situation in a ludicrous light.

"Bounding across the ice like a whippet. Ha, ha! You should send that one in to the fellow who collects the best similes for the year. Send your picture with it, a full length profile. At an extremely remote period, it may be that you bore some slight resemblance to one of these here now racing dogs, but, believe you me, kid the old gray whippet ain't what she used to be. If you had said a hippopotamus, now, or a beer keg, or even a little round apple dumpling, I could recognize the analogy. Are you sure you were not thinking of a penguin?"

"One of these hardy birds might make the trip under the conditions outlined, but you would have just about as much of a chance as you have of resembling a whippet. You might waddle and creep for half a mile, then, overcome by cold and fatigue you would collapse in great agony and congeal into a ball of ice, another vain sacrifice on the altar of ignorance and good intentions."

"Ignoring for the moment," I interrupted, "your scurrilous reference to the appearance of a certain person I always have held in the highest esteem, I should like to have your authority for the statement that frozen people die in great agony.

The consensus of published opinion is that death by freezing is painless, in fact, that it rather pleasant."

"Well," said Bill, "since you ask me, I'll tell you. I have the highest possible authority for the statement, and that is my own."

"Very interesting," I admitted, "but slightly indefinite. Where and when were you frozen to death? If more than once give date and locality. Is it a family trait, and if so does it follow the male or the female branch? Any attempt ever made to restore animation? Why?"

"Did you ever hear of the cat that died of curiosity? One question at a time, my lad, is enough. Sometimes it is more than enuugh. Touching now on your first question I find that I took in too much territory. After I have modified my original statement, you will find that the other questions require no answer.

"I never actually was frozen to the point where life became extince, but I have been within whispering distance of it more than once. Without exception, I think the frozen gate the most painful of all the gates leading to the promised land.

"Down in the old town you were talking about a few minutes ago I met a lad who almost pushed me through the gate. The night was bitterly cold and I was hurrying home —every person walked in those days—when this lad hailed me after the manner of what's-his-name, the Ancient Mariner. He had no tale to tell, but he held certain views on the subject of elocution and the art of public speaking and he wanted to give me the benefit of his opinion.

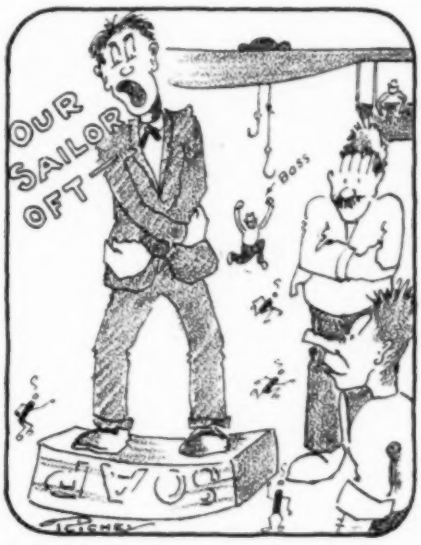
"Like his famous prototype, he was troubled by spirits, but his spirits were inside and rendered him immune to the biting cold that rapidly was converting me into an icicle. The air was cold and still, one of those nights when the sleigh runners screech on the snow, the trees crack with the frost and the cold penetrates through clothes and flesh and seems to congeal the marrow in your bones.

"His pet grievance was the decadence of the gesture. Would I believe him when he told me he had attended a smoker that very evening where a fellow had recited that sterling composition, *Napoleon and the British Sailor*, and kept his hands in his pockets all the while he was doing it? Terrible, simply terrible. Appropriate gesturing with the hands and suitable posturing with the head and other parts of the body are absolutely essential to the proper presentation of this or any other composition.

"I agreed with him heartily. He had the right idea and I would be glad to take the subject up with him again. If he would excuse me I would be pushing along. English sailors have hearts of oak and presumably are immune to frost bite. I was not sure about my heart, but basing my opinion on the condition of my feet and hands I was morally certain that if I remained there much longer my heart would be a lump of ice.

"He assured me he would keep me only a minute. Just a minute while he showed me how Napoleon and the British Sailor should be done by a guy as knowed how it should be done.

"I have laughed many times since at the recollection of that exhibition. He was a long, lank funny looking gink anyhow and his gesturing and posturing were about the most ludicrous and grotesque I ever have seen.



This was before the day of the crooner

but on that occasion my suffering was so acute I could have split him cheerfully with a tomahawk and then burned him at the stake. In fact a mental contemplation of the noble blue alcohol blaze he would make, was the only flicker of pleasure I had out of the incident."

"All I can remember of that old poem," I said, "is that the last line: Our sailor oft could scarcely shift to find a dinner plain and hearty, but never changed the coin and gift of Bonaparte."

"That's it," Bill admitted, "pretty awful drivel, if you ask me. You can imagine what it sounded like coming from a half pickled goat.

"All this reference to heat and cold reminds me of an inquiry I had recently from a foundryman who wrote that he would greatly appreciate my kindness in outlining briefly what is meant by the term *short cycle anneal* as applied to the process of producing malleable iron castings.

"In the usual method practiced by the majority of malleable iron foundries and which takes from 7 to 8 days, the castings first are raised to a temperature of 830 degrees Cent. (1516 degrees Fahr.) held at that temperature for 60 hours and then allowed to cool at the rate of 2 degrees Cent. per hour to a temperature of 645 degrees Cent. (1193 degrees Fahr.)

"Several different treatments have been developed for annealing malleable iron castings in a shorted period than that which has been customary in the industry for many years. All these treatments involve heating the castings rapidly to a temperature of over 925 degrees Cent. (1717 degrees Fahr.) holding the castings at this temperature for a definite period and then cooling them slowly through the critical range.

"In one of the short cycle methods, the castings are heated rapidly to a temperature of 955 degrees Cent. (1751 degrees Fahr.) held 16 to 20 hours and then cooled quickly to about 730 degrees Cent. (1346 degrees Fahr.) in approximately 1 hour. The castings then are held at that temperature for 48 hours, and cooled to handling temperature.

An annealing cycle in which the time is cut from 8 to 5 days includes heating rapidly up to 925 degrees Cent. (1717 degrees Fahr.), holding at this temperature for 12 hours, cooling in the furnace to 785 degrees Cent. (1447 degrees Fahr.), holding at this temperature for 1 hour and then cooling at the rate of 5 degrees Cent. per hour down to 590 degrees Cent. (1094 degrees Fahr.), then quenching in air as rapidly as possible.

The General Electric Co. developed a short cycle anneal which only extends over 27 hours. The castings are heated to a temperature of 980 degrees Cent. (1796 degrees Fahr.) in about 11 hours. They are held at this temperature for 4 hours, reduced to a temperature of 740 degrees Cent. (1364 degrees Fahr.) in 4 hours, held at this temperature for 4 hours, dropped to a temperature of 730 degrees Cent. (1346 degrees Fahr.) and held for 4 hours, then dropped to a temperature of 715 degrees Cent. (1319 degrees Fahr.) and held for 4 hours and then allowed to cool in air.

If a broken test casting is unsatisfactory the castings are reheated to a temperature of 800 degrees Cent. (1472 degrees Fahr.) and held at this temperature for a varying period depending on the appearance of the fractured sample. The castings then are reduced to a temperature of 740 degrees Cent. (1364 degrees Fahr.), held for 4 hours, and a cycle followed from that point similar to that previously described.

Made Representative

M. K. Epstein Co., 121 Lyman street, Springfield, Mass., has been appointed eastern representative for the Railway Locomotor Co., Chicago, and will handle the sales and service of the latter's Vapofier in New England, New York, New Jersey, Maryland and Pennsylvania. The product is a device for changing a distillate fuel into its gaseous state and mixing it with air.

Mixing Copper with Lead

(*Continued from page* 25)

any metal or flux that will promote porosity of the copper also will hold the lead in solid solution, and converse deoxidizers added to the copper to promote density of the metal, will throw out the lead.

That is particularly the case of phosphorus. One of the easiest ways of encountering difficulty in making the copper-lead alloy is to neglect to bring the temperature in the furnace high enough. It has been found that when two metals of greatly dissimilar melting points are alloyed it is necessary to preheat the mixture to a much higher point than usually is thought necessary to obtain a perfect alloy. With high lead-copper alloys, as with high zinc copper alloys such as manganese bronze, heat is necessary to make an alloy realizing the highest results. Melting and alloying at the lowest possible temperature to avoid oxidation costs the brass founder who labors under such a delusion considerable money.

It is not necessary or expedient to pour the metal into molds at the highest temperature reached in the furnace. Allowance has to be made for the drop in temperature inevitable to handling the metal to the molds, but if it should be necessary to cool it a little, even after skimming and carrying off operations are performed, it does no harm. In the case of the lead-copper mixtures, it is necessary to protect the metal from gases of the furnace while being preheated. In fact this should be done with all metals and alloys.

Use Hydrogen Iodide

A German method of obtaining homogenous alloys of lead and copper consists of passing hydrogen iodide through the molten mixture of the metals. To produce an alloy of 220 pounds of lead and 110 pounds of copper about 1⅜ cubic feet of gas, containing 30 per cent of hydrogen iodide and 70 per cent inert gas is passed through the bath for 5 minutes. A harder final product is obtained if the passage of the gas is continued for a longer period. It is not easy to determine the effectiveness of that method as it is difficult to apply.

Calcium will hold lead in copper to some extent, and prevent segregation. Sometimes it will fail to do so, due probably to the fact that the best method of handling calcium in copper never has been studied in a scientific manner. In one experiment addition of calcium may produce dense, sound copper castings in sand molds, the castings having high electrical conductivity. In another experiment, the castings may be finely porous, a condition greatly favoring retention of lead in high lead copper castings.

In early days the mixture of lead and copper was termed *Pot Metal*. Lead, states Graham in the *Brass Founders Manual* has a tendency to separate and cannot be employed in larger proportion than 8 ounces to the pound of copper. He mentions different alloys as being used in England in the Sixty's one a red ductile alloy of from 2 to 4 ounces of lead to the pound of copper; a second known as drypot metal, containing 6 to 7 ounces of lead to the pound of copper, and wet pot metal containing 8 ounces of lead to the pound of copper. The latter was termed wet pot metal because the lead oozes out of the mixture as it solidifies. No doubt the old brass founders were wise enough to add tin to the lead and copper mixture. Also they probably knew how to use fluxes to prevent segregation of the lead, thus producing better alloys than the simple lead-copper mixtures.

Antimony Holds Lead

Following these suggestions of Graham for making the socalled pot metals, the author produced the following formulas for leaded alloys, which have proved useful for applications where such highly leaded alloys were indicated: (1) 69 pounds of copper; 1 pound of antimony; 30 pounds of lead; and 2 pounds of litharge. The litharge is used as a flux and not as a percentage of the alloy. It holds in the lead perfectly, the fracture of the alloy is uniform and dense, the color whitish when fractured and the lead is thoroughly intermixed. (2) 58½ pounds of copper; 40 pounds of lead; 1½ pounds of antimony; 3 pounds of litharge used as a flux. The fracture of this alloy is dense in structure and whitish in color. The lead appears thoroughly mixed, with no segregation in either case; the brinell of No. 1, alloy is 29.7; that of No. 2 alloy, 24.5.

Antimony assisted by litharge appears to be effective in preventing segregation of lead in alloy with copper. Such mixtures cannot be compared with the copper-lead-tin alloys, such as 80-10-10 copper-tin-lead, and the metals of that type, commonly used as bearing metals. Antimony-lead-copper alloys find use for battery castings, and small castings generally where the percentage of lead is higher than can be held in solution by tin alone. Antimony is cheaper than tin and less antimony is required to prevent segregation than would be the case with tin. Therefore as a low cost but good metal there are many uses for which the highly leaded alloys containing antimony are serviceable.

The boiling point of lead, according to Johnston is 1640 degrees Cent.; (2984 degrees Fahr.) and the vapor pressure 1 millimeter at 960 degrees Cent.; (1760 degrees Fahr.) so while the boiling point of lead is considerably higher than the temperature at which brass is poured, there is some volitization of the lead at that point. Therefore in foundries specializing in highly leaded alloys, efficient ventilation is important to protect the health of the worker.

Oxides Sometimes Needed

Oxides of lead also should be better known in brass foundries as a means of preventing porosity in castings. It generally is believed that most porosity of castings is caused by oxidation of metal in the furnace where the metal is gassed and filled full of holes like pores. It is thought the remedy is to add phosphorus, which will combine with oxygen and remove it, and difficulty will be remedied in that way when the trouble maker in the brass really is oxygen. However it rarely is oxygen that is the source of porosity, but lack of oxygen, so addition of phosphorus does no good but rather tends to make the condition worse. In the *Transactions* of Faraday society, 1924, the French metallurgist A. Portevin tells how he made an alloy of 88 per cent copper; 6 per cent tin; 3 per cent zinc and 3 per cent lead and melted it in a furnace with the oil flame impinging on the metal.

It may be well to deviate a moment to call attention to the oil flame that impinged on the uncovered metal. Foundrymen have done it often, and have felt certain that the flame was oxidizing the metal. When superheating to pouring temperature or holding metal in the furnace after taking out a ladle it has been thought that the metal was being oxidized if the flame impinged on the bare metal while keeping it hot. Charcoal was placed on the metal to protect it while reheating. With all of these precautions porous castings were secured after that first ladle, which was exceedingly puzzling since phosphor copper had been added before pouring out the second ladle.

Portevin did the same thing and got the same results minus phosphorus. His castings were riddled with minute blow holes, but he attributed these to reducing gases, and not to oxygen. Therefore his method of treatment was different. Instead of adding phosphorus, or some densifier or deoxidizer for which extensive claims were made, he just sprinkled on the skimmed surface of the metal with an ounce or so of red lead to each 100 pounds. He added

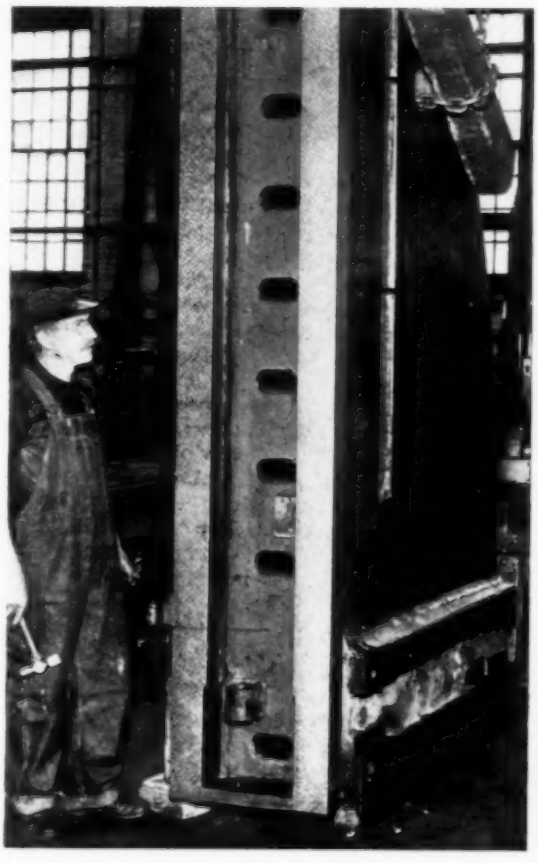
(*Concluded on page* 58)

Foundrymen are making alloy-iron castings of all types with **Mayari** ★

Compressor cylinder casting made with Mayari

Spur gears made with Mayari

Carbureter parts made with Mayari



Large machine tool casting made with Mayari

HIGH-GRADE alloy-iron castings covering a wide range of uses are being made with Mayari Pig Iron. Fine machine-tool castings, crusher plates, motor-truck brake drums, carbureter parts, large gas-engine cylinders, gear castings—these are but a few random items taken from the long lists of castings to which Mayari has been successfully applied.

Mayari has gained such wide application because it is simple and economical to use, and highly effective. It is a natural nickel-chromium pig iron. A small percentage, added to the mixture in the cupola, imparts to the castings a number of very desirable properties, including greater strength and solidity, smoother surfaces, finer, closer grain structure, added resistance to heat and wear, easier machinability.

One important advantage of Mayari is the way in which it is applied. Being part of the cupola charge, the nickel and chromium contained in Mayari are completely and uniformly disseminated throughout the casting mixture. Further, so small a quantity of it is needed to produce the desired results that the cost of the improvements due to Mayari is almost negligible.

BETHLEHEM STEEL COMPANY

GENERAL OFFICES: BETHLEHEM, PA.

District Offices: New York, Boston, Philadelphia, York, Wilkes-Barre, Baltimore, Washington, Atlanta, Buffalo, Pittsburgh, Cleveland, Cincinnati, Indianapolis, Detroit, Chicago, Milwaukee, St. Paul, St. Louis, Houston, Dallas. *Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Seattle, Los Angeles, Portland and Honolulu. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

★ BETHLEHEM ★

(*Concluded from page* 56)

oxygen, and a little lead of course, but the oxygen is what was wanted. Then he stirred the metal well and poured it, and the castings so treated were perfectly sound and free from blowholes. These were the same castings that previously had been porous.

When trouble shows up from porous castings and the favorite deoxidizer is ineffective, try the lead oxide. Perhaps the procedure has been in the wrong direction and oxygen should be added, rather than to try to remove it when it is not there. Either red lead or litharge can be used. Red lead is a bright red powder its formula is Pb_3O_4. It is made by heating lead oxide in the air and is used as a pigment in the rubber industry, as a flux in the manufacture of glass, in metallurgy, ceramics, match making, and various industries. Litharge is lead oxide, and the best grades of red lead contain litharge. The cause of the porosity is largely carbon monoxide gas, which combines with the oxygen of the lead oxide to make carbon dioxide gas which is driven out of the brass and removes the porosity.

Salesmanship in Selling Castings

(*Concluded from page* 23)

Well, that was all right. It was concise. It wasted no time. But it pulled few orders. Some time ago, this same firm got a sales manager who knew his job, and he proceeded to overhaul the estimating department on its quotation side. Thereafter, the quotations read something like this (I invent an imaginary case by way of illustration).

Suggestion Benefits Customer

Dear Sirs,

We were glad to find our Mr. Jones' recent visit to you followed by an inquiry for manganese steel castings to your drawing No. X.301. You are perhaps not aware that for the purpose for which these castings are required, as specified by you, manganese steel, though practicable, is not the best possible material. If we were to supply castings exactly to your specifications, our price would be.....$10.00 per hundred pounds for rough castings, finish-ground to size, patterns provided by you.

Manganese steel, we must point out, has a tendency to spread under a hammering action, such as these castings will encounter, and this would affect its serviceable life. In the circumstances we strongly recommend you to use chrome steel castings, which have very good wear-resisting properties, and do not flow under hammering action. For chrome steel castings, exactly as above, our price would be.....$8.50 per hundred pounds.

Our object, as Mr. Jones pointed out, is to act as your technical advisors in everything relating to castings, and we feel it our duty to point out how you can save money. Incidentally, your inquiry calls for finish-grinding, but by using a modern super-steel we can successfully turn the parts to be ground. This would reduce our price considerably, and if you are in agreement, we can reduce the above price for manganese steel by 0.50 cents per hundred pounds. Our price for chrome steel allows for machining instead of grinding.

We should deliver, if the order is received promptly, within four weeks from receipt of patterns, and the terms are as specified at the foot of this quotation form. Your order, if received, will have the special attention of our Mr. Robinson, who is in charge of our wear-resisting steel section. If you wish at any time to get a quick answer to any queries in regard to this order, mark your letter for his attention, and a reply by return mail will reach you.

Yours faithfully,

Of course, not every quotation calls for so much detail, but an endeavor was made to avoid the curt, stereotyped quotation. It meant more work, but it meant more orders. A point to be noted is the suggestion in the letter that the order is receiving someone's special attention. That tells. It makes the phrase "our best attention" alive instead of dead. It convinces. It is salesmanship.

The reason for (C) is dealt with largely in the previous remarks and example. (D) is rather different. Here is another case where the perfunctory quotation loses orders. Too often delivery promises are made hastily and at random, or falsely, with a deliberate intent to secure the order at any cost. In the long run this does not pay. The customer receiving a quoted delivery promise of four weeks from such a firm gets into the habit of adding 50 or more per cent on to that time, and then placing the order with someone else who quotes 5 weeks.

If experience shows that the quoted delivery times are, on the whole, reasonably accurate, the customer registers the fact in his memory, and when delivery is important, he places the order with the firm whose word he can trust. One foundry sales manager of my acquaintance recognizes the importance of this point, and at the foot of every quotation, he puts, in red, the words: "If you place the order with us, and have any difficulty in regard to delivery, please drop a line to the undersigned personally."

Some critics regard that as a dangerous procedure, because it puts into the customer's mind the notion that there might be delivery delays; but in practice, it does not work out so. The customer feels that if the delivery promise is not kept, someone will suffer for it; a real official is responsible. That influences him in placing orders.

Reason (E) raises a point of special interest, on which space will not permit dwelling unduly. Many foundries have had wide experience, some in one direction, some in another. But how many of them make sure their customers know about it? Only a short time ago, a steel foundry of my acquaintance discovered that one of its best customers for stainless steel castings had been for years placing orders for dynamo-magnet steel castings with another foundry in a different location. Asked the reason, the customer answered. "Well, I hadn't the slightest idea you people had had much experience with dynamo-magnet castings. I thought stainless was your line." "But you knew we made them," the salesman protested. "Oh, yes; but I didn't know you made them to any extent. I thought it was just a sideline, and as the other people always said it was a specialty of theirs, I naturally gave my orders to the foundry I thought knew most about it."

Should Know Simple Facts

Do the founder's customers know at all, or know well enough, just what his experience is, what his specialties are, what he can do and what he can't do? I ask this question, because recently it was brought to my knowledge that a certain iron founder's salesmen didn't know what was the biggest casting he could produce; what was the smallest casting he could produce; exactly how long he had been making iron castings; what there was of special worth and interest in the process he employed for making them; and numerous other facts. Obviously, the sales manager must make sure his sales force knows these things and tells the customer. For the rest he must rely on advertising and circularizing to bring his message to the right people.

Covers Refractories

Simplified practice recommendation covering cupola refractories recently was mailed, by the division of simplified practice, bureau of standards, to all interests in the industry for consideration and written ap-approval. The recommendation, which was proposed and developed by the industry, concerns the sizes and varieties of cupola lining, one and two hole tap-out blocks and slag hole blocks. The recommendation will be effective on announcement of the department.

Controlling Steel Foundry Sand

(*Continued from page* 31)

smoother, and finer facing. Addition of 30 per cent of silica flour will decrease the dry strength from 20 pounds to 15 pounds, or in that ratio.

When close control is held on incoming foundry refractories and the same mix is maintained, it is not necessary to determine the dry strength on all batches of sand mulled or otherwise mixed. Originally it is necessary to set up a mix for dry sand molding, having the proper dry strength. In the steel foundry of the Bethlehem Steel Co., Bethlehem, Pa., all batches of sand are not checked. Only occasional mixes are tested.

In addition to sand and binder, dry strength is dependent on water present and intensity of mixing. As the water content does not have to be controlled closely, it is comparatively simple to train an operator to keep the sand within reasonable limits by sense of feel. Average water content of sand prepared for dry sand molding generally averages between 7 and 8 per cent. To go below 7 per cent is to cause a reduction in dry strength dependent on the deficiency of water. The dry strength of sand containing 6 per cent water generally runs about 25 per cent less than that containing 7 per cent.

The wetter the sand, up to about 9 per cent water content, the greater the dry strength. However, high water content, namely above 8 per cent makes the sand less workable, causing increased difficulties in drying and adding to the drying cost.

Open Backing Sand

Permeability, while of paramount importance in green sand molding, plays a minor part in dry sand casting. It is true that the more open the backing and facing sands the easier and faster the molds will dry, but it is also true that the heavier the metal section the more compact and dense must be the facing sand. This is brought about by the addition of silica flour in amounts ranging from 10 to 50 per cent. In such cases, the permeability decreases rapidly. To maintain an open backing sand is an advantage.

This requires special equipment for removing the *fines*. Such apparatus is far more important when green sand molding is in the majority. In the average shop, specializing in dry sand jobbing work, permeability of the sand usually will run from 10 on heavy work, to 55 to 100 on light-medium castings. When the sand is dried, however, permeability increases in all cases, often as high as 100 per cent.

Careful watch must be kept over permeability, moisture content, and green and dry strengths of green sand casting. The higher the permeability, provided the green dry strengths are maintained satisfactorily, the sounder will be the castings produced. Maximum permeability obtained is dependent on the sand employed and the binder added to it. Maximum permeability maintained in practice is dependent on the degree of cleaning the old sand receives and on the surfaces of the castings produced. Where facing sand is employed, its permeability is limited by openness of backing sand, as it is useless to maintain an open facing if backing up material is of much lower permeability. For the individual shop, permeability is best arrived at by keeping it as high as possible, yet getting clean and moderately smooth castings. Provided the refractoriness of the sand is right, rough castings mean too open facing sand, which must be corrected.

For green sand casting a sharp sand generally is employed to which is added sufficient corn flour, bentonite, clay, etc., to produce the necessary green and dry strengths. Water must be controlled closely the best moisture content for a particular shop making green sand castings depending on the base sand employed as well as on binders added.

In most cases water contained in prepared sand will average close to 5 per cent. If moisture content goes much below that set for best results, resistance of sand to vibration, and when being poured, to erosion will be decreased greatly. If, on the other hand, moisture is too high, cold shorts, blows, and scabby castings may result. A simple method of testing for the water content in the sand is to dry out a known weight of it at 212 degrees Fahr., weighing after drying and determining the moisture content by the loss of weight.

Samples taken from that prepared in the shop also should be tested for permeability, green strength and dry strength. These tests take about 5 minutes each, barring the time taken for drying out the briquets for the dry strength test. This time is 1 hour. These three variables are seldom out of line with a constant mix.

Dry Strength Important

In green sand casting as in dry sand work, dry strength of the sand is important. If sufficient green strength is maintained to make the sand workable, proper dry strength generally will be secured. A minimum dry strength of 7 pounds per square inch is necessary for clean castings. Test briquets are baked at 400 degrees Fahr.

Control exercised in the core room is best divided into heavy and light-medium steel castings. When making cores for castings having heavy sections or where the core will receive considerable punishment from the hot metal, a refractory, dense, and fairly hard facing for the core must be employed. Such a core sand facing generally will run between 30 and 45 pounds per square inch dry strength, briquets being baked at 550 degrees Fahr. Its permeability will be low due to silica flour being added. Backing sand for this strong sand is open but weak, testing about 3 pounds per square inch dry strength. Control for this class of core sand is best carried out by careful choice of the core binder, together with the percentage used and the proportion of silica flour added to the sand. Since cleaning is paramount, the use of old sand, especially that containing any quantity of *fines* often is not economical. Close touch should be kept with the cleaning floor and changes made in the core sand to get the best and easiest cleaning mix.

For light or medium weight castings, where the metal sections are not heavy enough to resist cracking on cooling (due to the failure of the surrounded cores to give or lose enough of their strength to weaken them), a different type of core sand must be employed. For that class of core sand many foundries employ oil sand while others use the regular core sand mix minus the silica flour which always tends to make the core more resistant to deterioration under heat. In this latter case the dry strength of the core sand when baked at 550 degrees Fahr. will average between 15 and 25 pounds per square inch. In the case of oil sand its dry strength baked at 400 degrees Fahr. will be between 40 and 65 pounds per square inch. The ratio of oil to sharp sand for satis-

Foundry Practice

SELECTION of methods of testing molding sand best adapted to conditions encountered in the particular shop, and the application of the tests to incoming materials and to sand mixtures, is the subject developed in this article, which is from a paper presented at the Detroit convention of the American Foundrymen's association. Mr. Leum, combustion engineering department, Bethlehem plant, Bethlehem Steel Co., has included considerable data on the foundry practice of that company.

factory cores depends to a great extent on the type of oil used.

It seldom is necessary to add silica flour to oil sand for metal thicknesses less than 2 to 2½ inches. To exercise control in that class of core sand, one must first determine the most economical oil to employ, set up a specification on it and enforce it on future shipments. Mixing sharp sand, oil and additional binder to give dry strength should be controlled with respect to percentages of oil and binder added and percentages of water employed.

When mixing sand, oil, corn flour and water it is best practice to mix the sand, oil and water first and then the oil is mixed thoroughly in the sand to add the corn flour. This will develop the green strength more rapidly than any other order of mixing. Many foundries employ dextrine as the binder for cores. Choice of binder is determined on the basis of the one best suited to shop conditions and most economical.

A good test to determine ability of a core mix to break down sufficiently to relieve strains in a casting and one which has worked out satisfactorily in connection with core room practice is as follows: Ram the core sand into briquets in the regular way. Make two sets of briquets. Bake one set at 400 degrees Fahr., and the other set at 1200 degrees Fahr. for 15 minutes. Allow these briquets to cool. Then break them in the dry strength apparatus. Care must be taken not to break the cores by handling in placing them in the test machine, particularly those baked at 1200 degrees Fahr. If they are broken, their strength can be taken as less than one pound per square inch. The set baked at 400 degrees Fahr. will show the strength of the cores when placed in the molds, preliminary to pouring. The set baked at 1200 degrees Fahr. will show the loss in strength that may be expected in the core after being surrounded by the molten metal. If this strength is still over 3 pounds, trouble may be expected in cracked castings. This test is only meant for application on light section work, or where the *setting up* of the steel is so rapid that little time is allowed for destruction of the core binder.

Holds Outing

Midsummer outing of the New England Foundrymen's association was held at Chopmist Hill inn, North Scituate, R. I., Wednesday, Aug. 10.

Instruction in principles of personnel supervision as related to contacts of industry with employees, customers and the public, has been inaugurated as a part of the curriculum of general engineering department, Iowa State College, Ames, with Prof. Frank D. Paine in charge.

Life-Size Bust Made of Stainless Steel

A life-size bust of the American actress, Katherine Cornell, particularly famous for her portrayal in "The Barretts of Wimpole Street," recently was cast in stainless steel by the Cooper Alloy Foundry Co., Elizabeth, N. J. The sculptor was Karl Illava, New York.

The bust, shown in the accompanying illustration, is considered the first piece of statuary to be cast in the 18-8 alloy. The exact analysis of the casting is as follows: Chromium, 18.69 per cent; nickel, 9.14 per cent; carbon, 0.18 per cent. The mold was made from a plaster model supplied by the sculptor. The bust was cast with a false core, making the thickness of the casting from ½ to ⅝-inch. A sand core was made from the mold and filed down to secure the proper wall thickness. The casting weighs 65 pounds, after being finished.

Thickness of the casting varies from ½ to ⅝-inch

A specially fine sand mixture was employed and the mold was dried thoroughly. Due to the type of metal used, it was necessary to employ a large riser or feeder on top of the casting, placed directly between and over the shoulders. The model was made so that only two other false cores were necessary, thus making it a comparatively simple molding job. The mold was rammed particularly hard, so much so in fact that the plaster model eventually was broken. However, the break occurred in position where it was repaired easily.

A single ladle was used to pour the casting, but the runner was made large enough to take the rapid flow of metal. Precautions were taken against inclusion of dirt. The metal was poured at approximately 2950 degrees Fahr.

The casting was given a satin finish in the polishing shop of the foundry. After the bust was polished, it was entirely free from surface defects and created an unusual effect due to the reflections from various angles. In finishing, it was necessary to use hard grinding wheels throughout, thus differing from the type used in finishing bronze castings of a similar nature. Chasing was accomplished chiefly by filing, owing to the toughness of the metal.

An unusually beautiful smooth and velvety effect was obtained, making that metal available for similar objects. It is necessary, however, that the sculptors design the figure to meet the characteristics of the metal, as was followed in the production of this bust.

Book Review

Modern Materials Handling, by Simeon J. Koshkin, cloth, 488 pages 6 x 9 inches, published by John Wiley & Sons, Inc., and supplied by THE FOUNDRY, Cleveland, for $6 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., Caxton house, Westminster, London.

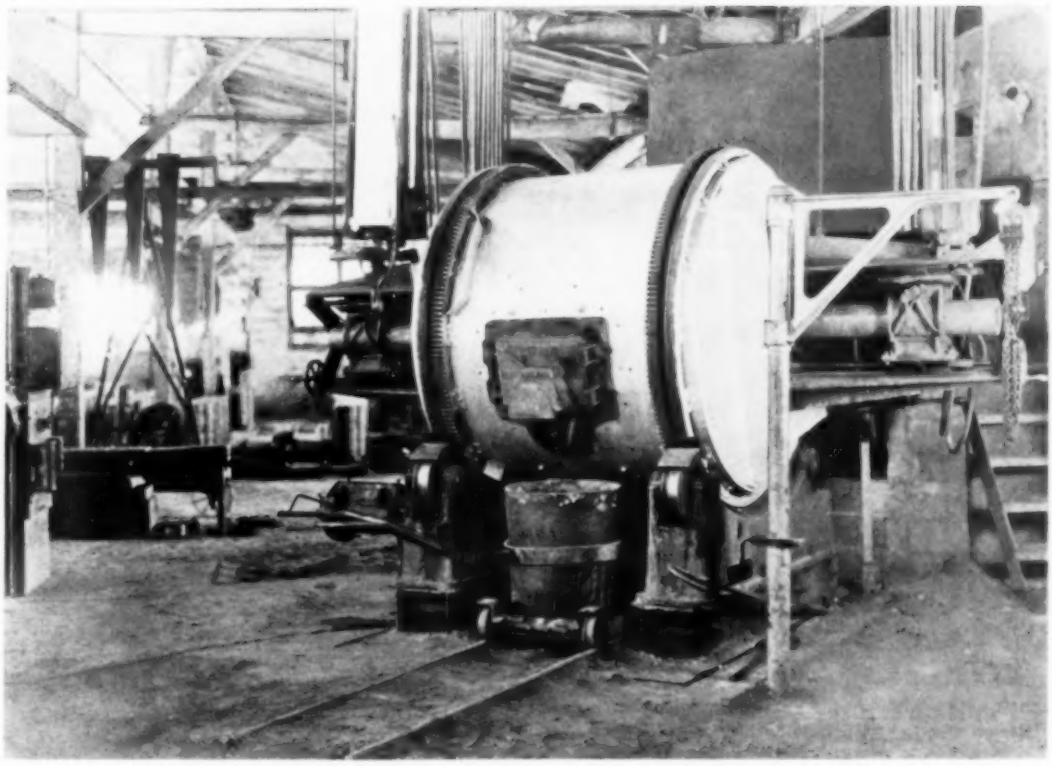
Remarkable progress made in the application of a wide variety of material handling equipment in practically every type of industry makes a work of this kind especially interesting and valuable. The book treats and analyzes modern methods of handling different kinds of materials and deals with the principles and considerations involved in the proper selection of the method of handling any kind of material.

The first chapter is devoted to general principles and classification of equipment, which, it is pointed out, are applicable in most instances, regardless of the size of the plant or the quantity of production; only the details of application differing. This is followed by detailed information on the various types of cranes, overhead or monorail systems, industrial truck equipment, conveyor applications including gravity, belt, roller, chain, etc., speed reducers, skip hoists, screw conveyors, bucket and other types of elevators, and coal and ash handling equipment.

The final chapter considers the problem of materials handling in the foundry. The book is exceptionally well illustrated with reproductions of photographs and drawings showing the various types of equipment discussed and the application to particular handling problems.

Earl H. Seelbach, has been appointed district engineer, Despatch Oven Co., with offices at 381 Elliott Square, Buffalo. Mr. Seelbach's territory will include western New York state and Erie, Pa.

A Metal Melting Machine



3000 / 6000 lb. Detroit Rocking Electric Furnace Installation

No Miracle . . No Alchemy

IS PERFORMED IN THE

DETROIT ROCKING ELECTRIC FURNACE

But it does effectively facilitate accurate control of analysis and of temperature, and its rocking action insures homogeneity and absolute uniformity throughout the bath,—all essential factors in the economical production of good castings.

ASK THE MAN WHO USES ONE!

Detroit Electric Furnace Co.

829 W. Elizabeth St., Detroit, Mich.

How's Business?

(*Concluded from page* 18)

ucts, better quality and sales initiative are stressed as the principle need to start foundry busines back, according to an instrument manufacturer. Still another well informed manufacturer quotes a friend in the steel foundry business who believes that an actual shortage of scrap is likely to prevail in the near future, due to pickup in melt and also to the fact that many factories have not been producing any scrap of certain grades for about two years.

From the foundries, themselves, a similar wide range of opinion is forthcoming. An automotive shop does not expect to employ present facilities more than 30 per cent for the next year. Seventy per cent have had a greater volume of inquiries during August and a number report slowly advancing totals of orders on their books. The remainder note no increase in inquiries.

One New England foundry which during the fall of 1931 ran six days a week, dropped to five days with a reduced force during the close of winter and the spring. That rate fell to three days a week in the early summer, but has advanced again to six days full schedule with the coreroom operating until nine p. m. This is on small and medium jobbing gray iron castings.

Quickening Is Noted

The head of a large pipe firm, just returned from a wide business trip says that he finds conditions definitely better and expects improvement in pipe in the spring of 1933. Malleable demand is expected to improve materially during September, according to a western foundryman. Another in the same region says that in the first three weeks of August orders increased 30 per cent over the total for July, with a quickening of inquiry. On the other hand, an eastern malleable firm, reporting a similar increase in August sales believes it to be only a seasonal manifestation.

A midwest steel foundry states that inquiries have not picked up, but some demand is expected in September that will develop into a fair tonnage.

One of the most interesting and informative responses to the letters to foundrymen, is from a progressive gray iron foundryman in Illinois. He states that in the past six months the dollar value of sales has been fairly even, although the number of molders employed and the tonnage has varied considerably. The close of July and the first two weeks of August seemed to strike a low point in both tonnage and cash receipts. However, the melt picked up appreciably at the close of August. Many manufacturers served by this foundry are investigating new outlets and accordingly much new work is being figured. The trend seems to indicate returning confidence, everybody feels and talks better and business is on the upgrade. A literal quotation from this foundryman is indicative of thought in the industry. He says:

"The only thing left now is for the fool foundrymen to stabilize prices instead of cutting each other's throats. We are actually making castings at the present time for less money than my father got for similar work 30 years ago. Figure that out and you will see why the red ink manufacturers are working overtime."

As if in response to this fervent plaint, another gray iron foundryman writes.

"We have noted a stiffening in the market on castings in the last two or three weeks. In other words, we are not reducing our prices any more. Up until now, it has been difficult to retain our patterns against outside competition. Now we are taking the position that any of our customers can get lower prices, and if they so choose, we will give them a long list of foundries that are quoting lower prices. However, we have been able to hold our patterns at our present prices."

These quotations pronounce a benediction upon the various viewpoints abroad in the foundry industry. The lesson that they carry may provide the answer for which all hope, to the question, "How's Business?"

Many bright spots are apparent in the grist of news on foundry activities. Turn to page 70 Foundry Activities, supplement the preceding cross section of reflected sentiment by reading what various foundries are doing and then let each answer the question individually. THE FOUNDRY present the facts, makes no predictions.

Specifications for Gray Iron

(*Concluded from page* 33)

transverse strengths for various types of gray cast iron. Table I shows minimum values only. In cases where the manufacturer and purchaser agree upon transverse tests to govern, the proper range of transverse values may be taken from Table I or may be determined by pouring transverse and tension bars and then establishing a correlation for that particular cast iron.

Unless otherwise agreed upon by the manufacturer and purchaser, tension and transverse test bars shall be made under the same sand conditions as the casting. Bars shall be poured from a ladle or ladles of iron used to pour the castings. Pouring shall be done as nearly as possible at the same temperature at which the casting is poured. Test bars shall receive the same mechanical and thermal treatment as the castings. In the case of heat treatment, the test bars are to be treated adjacent to the castings they represent.

(*a*) The manufacturer shall supply and prepare all test bars as agreed upon. Two or more test bars shall be cast.

(*b*) If a faulty or unsound test bar gives a result not in accord with the specifications, the result shall be disregarded and another test made.

(*c*) In case of failure of a test bar a retest may be made. If the retest fails, the castings shall be rejected.

(*d*) In case no sound test bars are available for retest and optional transverse bars are available, tensile strength tests may be made on test specimens machined from transverse test bars, the dimensions to be as shown in Fig. 2.

True To Pattern

It is the intent of these specifications to subordinate chemical composition to physical properties. By agreement between the manufacturer and purchaser, the quantities of any chemical elements in the cast iron may be specified.

Casting shall be true to pattern and free from cracks, gas holes, flaws and excessive shrinkage. Surfaces of the castings shall be free from burnt-on sand and shall be reasonably smooth. Runners, risers, fins and other cast-on pieces shall be removed. In other respects castings shall conform to points specially agreed upon between manufacturer and purchaser.

The inspector representing the purchaser shall have free entry at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the castings ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the castings are being furnished in accordance with these specifications. All tests and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

Upon request of the buyer, the manufacturer shall be prepared to certify that his product conforms to the requirements of these specifications.

Melts Iron in Rotary Furnaces

(*Continued from page 27*)

thinking of changing the nature of its products, it began investigating claims for rotary furnaces fired with pulverized fuel. These furnaces already had been operating for some time in certain Continental foundries and were mainly of two types, the German Brackelsberg furnace and the French Sesci furnace. In Great Britain, the Sklenar rocking furnace also had been developed. Engineers from Armstrong-Whitworth were sent to the Continent to investigate conditions of operation and results of these furnaces. After a thorough study, the firm decided to install an experimental plant; concluding that the Sesci furnace would meet its conditions best. Therefore, a 5-ton furnace was erected in December, 1930.

Install Four Furnaces

After a period of tests, and following various modifications made, principally, to the coal pulverizing plant and to the control system, results were considered sufficiently satisfactory to justify installing a complete battery of furnaces, sufficient to produce the tonnage which up to that time had been obtained from the cupola plant. The complete plant comprises four rotary furnaces in line, as shown in Fig. 1, which is taken from the charging end. Looking from right to left, the plant includes one 10-ton furnace followed by two 5-ton furnaces, and, at the extremity on the left, one 2-ton furnace. In the left-hand back corner a spare barrel of 5-ton capacity can be seen standing up. This is the original barrel used during the experimental period and before erection of the present plant. This battery of furnaces was put into operation gradually, and by March, 1932, the complete battery was in use.

The Sesci furnace was described in the Nov. 15, 1930, issue of THE FOUNDRY. However, certain modifications have been made by the engineers of Armstrong-Whitworth, the principal one being the substitution for the charging methods used in the French plant by a Wellman Smith Owen, 3360 pound, ground type charging machine, similar to that used in the open-hearth steel plant and visible on the left of Fig. 1. That method of charging was found to be the most practical and efficient with the placing of the furnaces in line as shown in the illustration, and the charging machine runs on a platform parallel to the line of furnaces. A movable head mounted on wheels, is in front of the charging end of each furnace. This collects the gases from the furnace and conducts them to the recuperator, where air is preheated to 500 degrees Cent. before entering the furnace. At the time of charging, a ram on the charging machine pushes the movable head on one side, thus rendering the charging end of the furnace free. When the charging operation is complete, the charging machine pushes back the gas collector in front of the extremity of the furnace. Charging boxes are loaded in the stock yard, which can be seen on the left-hand side of the illustration, and are placed on tables, which are shown between the platform and the line of furnaces, by an overhead crane. The battery of furnaces is placed at one extremity of the foundry bay, the width of the plant being about 40 feet.

The coal pulverizing plant, shown in Fig. 2 has an output of 2 tons of anthracite coal and 4 tons of bituminous coal an hour. The latter coal is used solely for starting up, and after the ingoing air reaches a temperature of 200 degrees Cent.; anthracite coal is turned on and the bituminous coal shut off. The pulverizer is connected by a bucket elevator to the drying plant. The drying plant is charged by a large hopper and the coal is not handled again until it is consumed. Pulverizing is accomplished by forged steel balls, which are pushed round a manganese steel track at about 260 revolutions a minute. The finished product must be of a fineness equal to 85 per cent through a 200 mesh per square inch sieve.

Carries Coal 400 Feet

The coal is delivered from the pulverizer into a pump, which, by the aid of a very small amount of air for lubricating purposes, can deliver the coal up to distances of 3000 feet. With this installation the pipe conveying the coal is only about 3 inches diameter, and the coal is carried about 400 feet.

Total capacity of the pulverizing plant if working continuously during an 8-hour shift would be 32 tons. Since actual coal consumption of the furnaces is about 15 per cent of the tonnage of castings produced, it is not necessary to operate the pulverizing plant continuously. However, the unit was calculated with a view to the extension of the use of pulverized fuel in other directions.

The coal-distributing pipe reaches the back of the battery of furnaces, and the coal then is diverted through four different sets of two pipes to hoppers, one for each furnace. Each of the pipes can be opened or closed according to requirements. The coal then is conducted to the burner-end of each furnace, and a current of air, supplied by blowers, mixes with the pulverized coal and conducts it into the burner.

Air is provided by a positive pressure blower and is carried through the recuperator where it is reheated, according to the progress of the melt, up to 600 degrees Cent. It then passes under the coal hoppers, where it mixes with the coal, which itself is measured out by positive screw feeders, and the air and coal go into the burner. At the point where the pipe line joins the furnace, a rotary, air-tight joint is fitted, which prevents any loss of the carefully-measured air and coal. As the motors for the blower and coal feeders are of variable speed type, with push button starter and rheostat control, any quantity of air and fuel can be delivered at once at the will of the operator. By this method, the furnace is controlled, not only with regard to temperature, but also with regard to atmosphere, which can be made to be slightly reducing, neutral, or oxidizing. It is claimed that combustion is controlled so that it is complete inside the furnace.

Control Rotation

An interesting detail is the system of control for the rotation of the furnaces, which has been designed by the engineers of Armstrong-Whitworth, and is by motor, gear box and chain drive. Control is effected by push-buttons with electrical gear. Simply by pushing two of a set of buttons, one can start the furnace rotating in one direction or another, and the speed of rotation is determined by the gear box, a slow motion being obtainable for tapping purposes. This control is extremely easy to operate, and one man can take care of the four furnaces.

The total number of men necessary to operate the plant in full is as follows: Two crane drivers, 1 operator, 2 tappers, 1 charge operator, 4 laborers, 1 weighman and 1 boy. In addition, one man is required for the coal pulverizing plant.

The charges used for these furnaces vary, naturally, in accordance with the job, but up to 80 per cent scrap can be used in the charge. The firm also uses these furnaces to manufacture a specially refined pig iron which they market under the name of New Process Pig Iron and which they are prepared to sell to any exact analysis.

The four furnaces described can supply as much as 22 tons of molten iron in one operation. This battery is flexible, and anything between 1 and 22 tons can be obtained by combining the operations of one, two, three, or the four furnaces. The 5-ton furnace can be tapped about 1 hour 50 minutes after charging a full charge. This is an average, as tapping actually has been effected 1 hour 35 minutes after charging. The

10-ton furnace can be tapped just over 2 hours after charging. If starting cold, 3 hours must elapse before tapping. The temperature of the iron at the time of tapping ranges from 1450 to 1500 degrees Cent., but the iron can be superheated up to a temperature of 1650 degrees Cent. Metal has been repeatedly held hot in the ladle as long as 55 minutes before being poured, even into high-class cylinder work.

Capacity of the battery of furnaces is about 80 tons per 8-hour shift. The lining is of a monolythic type with a silica base, about 14½ inches thick, the average life of a good lining being about 150 heats without patching. The metal loss in this method of manufacture is said to be about 1 per cent.

Characteristics of Furnace

Some literature has been published on the metallurgy of the rotary furnace. Briefly, the following conclusions have been arrived at:

Iron melted in the furnace can attain a temperature as high as 1650 degrees Cent. This is explained by the builders who say that, owing to the rotation of the furnace and to the high temperature of the flame that heats the lining, the metal continuously is brought against the hot roof during its revolving movement, thereby overcoming the heat insulation effect of the layer of slag which forms itself at the top of the bath. The metal is only in contact with the refractory lining, it is pointed out, and it is protected from contamination by gases by the upper layer of slag. This avoidance of contamination is one of the advantages of the method. It is said the rotation of the furnace also causes a certain agitation of the bath, which generally is recognized to be of benefit to the texture and homogeneousness of the metal.

However, the outstanding feature attributed to the furnace is the effect of the high temperatures obtainable. Effect of superheating cast-iron is to produce in the final solid material an iron wherein the graphite is in extremely fine, evenly disseminated condition in a matrix of pearlite and ferrite depending on the degree and length of time of such superheat, pearlite being almost entirely present under the usual conditions employed.

Another effect attributed to the high temperature obtainable in the furnace permits a more complete control of total carbon, and particularly allows the melting of iron low in carbon, as it is possible to melt with ease steel or any other low-carbon material. This control of total carbon facilitates production of an iron of a desired structure. Low total-carbon cast-iron, in addition to producing fine graphite, also produces a finer grain structure, with a resulting increase in strength.

Similarly, for special duty conditions, the manufacturers point out that alloy cast-iron of any desired composition can be made, either as a complete or separate melt, where quantities warrant it, or by adding the alloying elements, including carbon, in a residual furnace bath or in the ladle. Another feature of superheated iron is that the elements usually present in cast-iron, such as silicon, manganese and phosphorus, have less effect on the iron than is the case at lower temperatures. Therefore, a wider range of castings can be produced from the same composition. It has been found, in actual experience, that with a total carbon of about 2.9 to 3 per cent, there is considerable elasticity in the permissible variation of silicon content. In other words, makers are not tied down to narrow limits, and have as much as a full 1 per cent margin for their silicon.

Actually, in view of the sensitive control which is claimed for the furnace, the silicon content can be kept within narrow limits, and, as has been said, practically any analysis of iron can be obtained. It is claimed that on one occasion, every constituent of an iron of a certain required analysis was accurate within 0.01 per cent. This explains how such a large variety of castings can be made easily by this process, and Figs. 3 and 4 illustrate two intricate castings with considerable variations in thickness.

When one considers this plant of four furnaces and the coal pulverizing plant that goes with it, it is obvious that the initial cost is substantially greater than is the case with a cupola plant of similar capacity. On the other hand, the operation and fuel costs are about the same. Some economy can be effected in the cost of raw materials, in view of the possibility of using high scrap charges, but the fact that irons of practically any analysis, and particularly high-duty cast-irons and irons of special quality, can be obtained leads the users to claim that, all factors being considered, the plant can be rapidly amortized; and that in the case of a foundry of fairly large capacity, the initial cost, as compared with that of cupola plant, is fully justified. Another advantage of the plant is its elasticity, since the furnaces are easily started or put out of operation, continuous work can be effected by combining the furnaces, and metal can be tapped practically throughout the day if required.

By far the greatest tonnage of magnesium products produced in 1929 were in the form of castings, according to a report of the department of commerce on mineral resources. Tonnage of magnesium castings produced was 116,350 compared with a total of 196,321 tons in all forms.

Committee Plans Symposium on Gray Iron

A committee has been organized to develop the program for the symposium on gray iron castings, to be held at the 1933 annual meeting of the American Society for Testing Materials in Chicago. This is the third of a series of four symposiums on cast metals sponsored jointly by the American Foundrymen's association and the A. S. T. M.

The object of the cast iron meeting, as determined by the committee, is to provide the engineering profession with authoritative data on the properties of cast iron. The value of thus reviewing the applicability of cast metals to industry, through the series of symposiums, has been demonstrated amply by the reception accorded that held in 1931 on malleable iron and the one of this year on steel castings.

Personnel of the gray iron symposium committee is as follows: Chairman, H. Bornstein, Deere & Co., Moline, Ill.; Dan M. Avery, The Foundry, Cleveland; A. L. Boegehold, General Motors Research Laboratories, Detroit; John W. Bolton, Lunkenheimer Co., Cincinnati; F. B. Coyle, International Nickel Co., New York; H. W. Gillett, Battelle Memorial institute, Columbus, O.; F. P. Gilligan, Henry Souther Engineering Co., Hartford, Conn.; A. E. Hageboeck, Frank Foundries Corp., Moline, Ill.; J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.; R. S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee; Oliver Smalley, Gray Iron institute, Cleveland; E. K. Smith, Electro Metallurgical Sales Corp., Chicago; E. H. Young, Climax Molybdenum Corp., Detroit. Secretary, Robert E. Kennedy, technical secretary, A. F. A., Chicago.

Malleable Club Sees Molding Sand Pits

Thirty members and guests of the Malleable club, Milwaukee, attended a picnic and meeting at Berlin, Wis., Aug. 20, as guests of Carpenter Bros. Milwaukee and the molding sand shippers of the Berlin district. The sand pits were in operation and the members were interested greatly in seeing how molding sand and core sand is dug, milled into the different well known grades for shipment.

A barbecue dinner was served at noon, and was followed by an informal discussion of mutual problems of shippers and users of foundry sands. After the afternoon inspection tour of the sand pits, a well fought 13 inning ball game between "Racine" and "Milwaukee" teams, resulted in a 2 to 4 victory for Racine.

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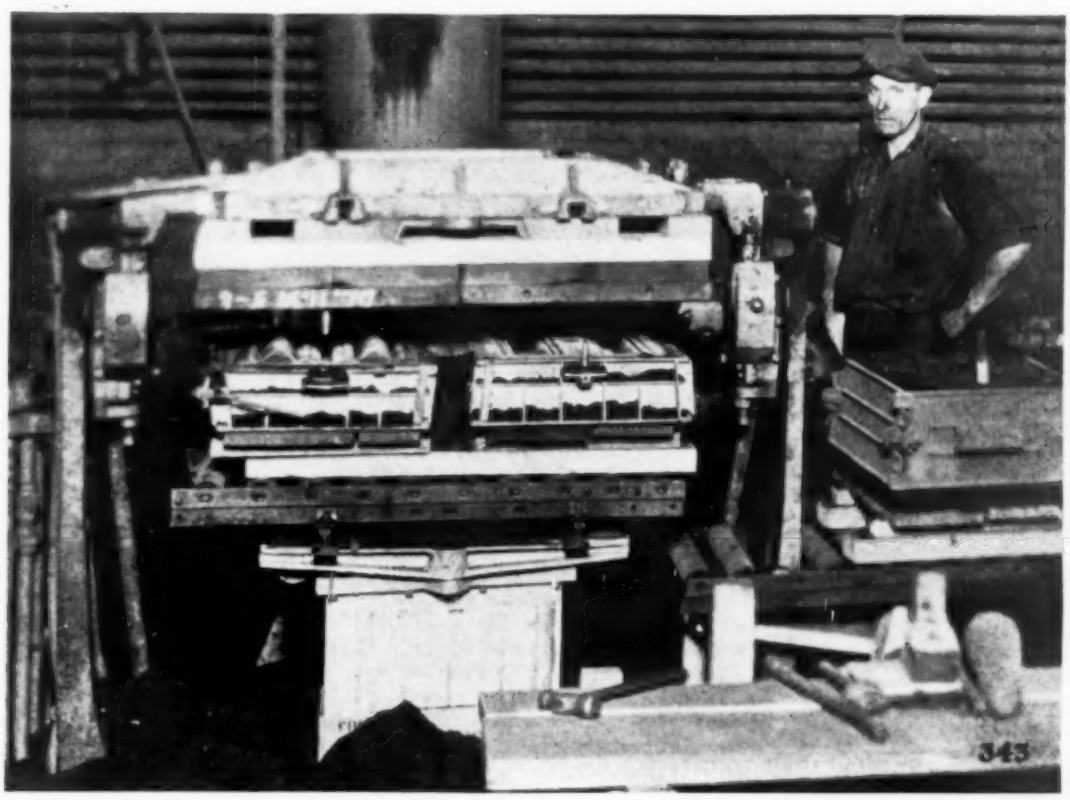

One foundry using a HERMAN Hi-Speed Jarr Rollover and Pattern Drawing Molding Machine, making both the cope and drag at one time, produced perfect castings at one third the former cost.

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Obituary

T. F. JENNINGS, 74, foundry superintendent, Utah Copper Co., Garfield, Utah, for the past 20 years, died in a Salt Lake City hospital Aug. 17 after a brief illness. Before his connection with the western company, Mr. Jennings served for a period as field representative of the National Founder's association and previous to that traveled extensively in his capacity of practical molder. He was born in Cambridge, Mass., Feb. 15, 1858, and his first experience of the foundry

T. F. Jennings

industry was gained in the eastern states. During recent years he carried on extensive experiments in production and composition of cast iron grinding balls employed in mills where copper ore is reduced to a powder. Papers on the subject were presented before conventions of the American Foundrymen's association in Detroit and Cleveland and also presented in THE FOUNDRY.

Frank Loeffler, 55, president and treasurer, Schwab Safe Co., Lafayette, Ind., died recently.

Julius Goslin, president, Goslin-Birmingham Mfg. Co., Birmingham, Ala., died recently.

James Hughes, pioneer foundryman, died at his home at Cedarburg, Wis., recently. Mr. Hughes was born in Brookfield, Wis., and served his foundry apprenticeship in Milwaukee. At the age of 22, he operated the Eagle Iron & Brass foundry at Fort Howard, Wis. For a number of years he was superintendent of the foundry of the Turner Mfg. Co., Port Washington, Wis. and he also was superintendent of the foundry operated by F. C. Mintzlaff, Grafton, Wis. Prior to retiring in 1921 he served for 8 years as superintendent of the Giddings & Lewis Mfg. Co., Fond du Lac, Wis.

Philip A. Myers, president, Chase Foundry & Mfg. Co., Columbus, O., and president, F. E. Myers & Bro., Co., Ashland, O., died at Cleveland, Aug. 5, following injuries received in an automobile accident near Ashland, May 30. When a boy, Mr. Myers invented a new type of pump, which interested his older brother, F. E. Myers then selling pumps, and while still young, he directed the manufacture of the invention. He found time also to develop a bent for invention, especially relating to farm equipment. He was 79.

Book Review

Wood Patternmaking, by Herbert J. McCaslin, 311 pages, 4¾ x 7½ inches, cloth, published by McGraw-Hill Book Co. Inc., and supplied by THE FOUNDRY, Cleveland, for $2.25 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster, London.

Revisions in practice and equipment have been included in this text book for students in patternmaking, originally published in 1923 and now presented as the second edition. The text consists of a series of problems developing the fundamental principles of patternmaking, and descriptions of various tools available for the work.

The book is divided into two sections, the first dealing with bench work and the second with lathe work. In each section complete and definite instructions are given on the order of operations required for completion of the various patterns. As pointed out by the author, the work is not intended to deal with production methods as applied to patterns and the examples selected follow those principles of molding and pattern construction which have established good practice where a limited number of castings are required from each pattern.

While the availability of the standard pattern color chart of the American Foundrymen's association is mentioned, it would seem that any text book of patternmaking should include a chart showing the system for marking patterns which now is employed in regular production by a large number of foundries and pattern shops throughout the country.

Study Noise

Title and scope of the noise measurement project of the American Standards association recently has been enlarged. The new title of the project is "Acoustical Measurements and Terminology" and the scope of the work will be as follows: Preparation of standards of terminology, units, scales, and methods of measurement in the field of acoustics.

Study Corrosion of Nonferrous Alloys

The elaborate and comprehensive test program for studying corrosion of nonferrous metals and alloys, which is being carried on by committee B-3 of the American Society for Testing Materials, is supported by many of the leading companies of the country. About 23,000 test specimens are being used in the work. Of course, 13,000 are in the form of standard tension test specimens, each carefully machined and finished.

Philip A. Myers

The remaining 10,000 are in various forms depending on the type of test. The most extensive program is that sponsored by the subcommittee on atmospheric corrosion. These exposure tests will extend over a period of 25 years.

Washington Scene of 1932 Safety Congress

Twenty-first annual safety congress and exposition will be held in Washington, Oct. 3 to 7. A special program of the metal section of the National Safety council is being prepared to consider practical, co-operative methods for promotion of health and reduction of accidents. The metals section meetings will be held at the Wardman Park and the Shoreham Hotels. F. A. Lauerman, Republic Steel Corp., is general chairman and H. W. Darr, Bethlehem Steel Co., is secretary of the metals section.

The sixty-second meeting of the Electrochemical society will be held in Cleveland, Sept. 22 to 24, at the Hotel Cleveland. Colin G. Fink, Columbia university, New York, is secretary.

Steel Castings in the Navy

(*Concluded from page* 29)

of importance from the point of view of improving foundry practice, particularly on subsequent castings from the same pattern. Some use has been made of X-rays for examination of castings, but the limitations are such as to render it of use only in small portion of the output of a steel foundry making large castings.

A study made by the Naval Research laboratory at Washington of the possibility of making radiographic examination of castings with the gamma-ray has led to the decision by the bureau of construction and repair and of engineering to adopt that method of examination of steel castings. The gamma-ray is an emanation from radium, and the navy has purchased one-half a gramme of radium sulphate for the purpose.

A discussion of some of the more important of the different hull castings will offer interest, and photographs of some of these are reproduced in the accompanying illustration. Obviously one of the most important of the hull castings is the stern frame casting which closes the hull structure at the stern and supports the rudder, taking the stresses occasioned through steering. One view of that casting is shown in Fig. 1. It is also in this casting that failures in service have occurred, causing serious expense and delay in replacement. In each case, the casting developed cracks and radiographic examination showed additional hidden flaws proving the casting in each case to have been unsound and not of high grade material.

Manufacture of deck ring liner castings for 8-inch gun-turret mounts presented such great difficulties to the foundries that at one time it was thought not to be possible to secure satisfactory castings. This casting is 23 feet in diameter, weighing 10,000 pounds in the rough, and having a constantly changing section with shear and camber to suit the deck. To avoid excessive weight and machining costs, it was necessary to cast and anneal this ring to within one-quarter of an inch of a true circle, (THE FOUNDRY, May 1, 1929).

Special study of the problem of producing this casting led to the decision to make it entirely in cores, about 82 cores being necessary. A circular annealing furnace was built up especially to care for annealing. While these measures were expensive, they were much less so than the numerous losses that had been experienced in attempting production in the usual manner without special measures.

More Castings Used

REMARKABLE progress in the technique of steel casting manufacture has been reflected in recent years by the greater use of that material by the United States navy. While in the main steel castings have performed exceedingly valuable service, trouble has been encountered in some instances because of difficulties and delays in securing satisfactory castings and the failure of defective castings actually installed.

The author, who is chief constructor, U. S. Navy, believes that the difficulties are due mainly to lack of co-ordination between the designer, patternmaker and the foundrymen. To some extent, improved foundry practice, methods of molding, chilling, size and location of gates and risers, etc., will solve some of the troubles.

This article is abstracted from a paper on "Notes on the Development of Certain Materials Used in Ships of the U. S. Navy," and was presented before the New York meeting of the Society of Naval Architects and Marine Engineers.

Safety Code for Foundry Workers Revised

"Safety Code for the Protection of Industrial Workers in Foundries," developed by a technical committee under the sponsorship of the American Foundrymen's association and the National Founders' association, has been approved by the American Standard association as an American standard.

The original safety code on that subject was approved in 1922 and the revision is based upon experience gained by industry, regulatory bodies and insurance interests through application of the code to conditions in foundries throughout the country. The revised edition follows the general form of the orginal code except that an appendix has been added containing safety suggestions covering operating conditions, which the committee felt would be harmful to foundry operators, foremen and workmen.

Copies of the code may be secured from the American Standard association, 29 West Thirty-ninth street, New York, or the American Foundrymen's association, 222 West Adams street, Chicago, for 20 cents each.

Develops Standard Methods of Analyzing

Aluminum Research institute, 308 West Washington street, Chicago, an association composed of smelters and refiners of ingot aluminum and its alloys, recently published its standard methods for sampling and analyzing aluminum and certain aluminum alloys. These standard methods, as prepared by a committee of the institute, are based on co-operative work carried out in member laboratories on standard samples of 99 per cent pure and 90-99 per cent pure aluminum silicon, aluminum-copper and aluminum-silicon-copper alloys with wide ranges of constituents. The samples used in checking were standardized by analytical work of an unusual degree of accuracy, which involved many months of painstaking labor in all of the member laboratories.

The methods are applicable to the determination of copper, silicon, manganese, magnesium, nickel, zinc, iron, tin and lead in aluminum and its alloys.

Book Review

Pricing for Profit, by W. L. Churchill, cloth, 271 pages 5½ x 8½, published by the MacMillan Co., and supplied by THE FOUNDRY, Cleveland, for $3 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., Caxton house, Westminster, London.

Ten years devoted to a search for correctable causes of inadequate earnings and 15 years in active consulting and management service, have shown the author that profit is indispensable to progress. Starting with the premise that every transaction must be profitable to all concerned—producers, vendors, workers and customers—that we may make maximum progress, the author shows the fallacy of the vicious practice, so frequently indulged in in times of business depression, of taking business to save overhead.

The discussion is centered around the following headings: Profit means progress; profit requirements; the law of quantity; ratio of selling to profit; pricing for profit; good will; wages, salaries and profits; obtaining correct profitable prices; synchronizing sales and production; advertising; dealer mark-ups; reducing cost and price corrections. It is suggested that a study of the principles disclosed may offer the thoughtful reader the idea that they involve a permanent solution to many large and pressing economic problems.

New Equipment

For Foundries

Pattern Table Actuated by Solenoid

Messrs. British Insulated Cables, Ltd,. Prescot has developed a molding machine in which the pattern table is actuated by electric current applied to a simple solenoid. The machine is distributed in Great Britain by Messrs. Pneulec, Ltd., Mafeking-road, Smethwick, England. A drawing of the working parts of the machine is reproduced in the accompanying illustration.

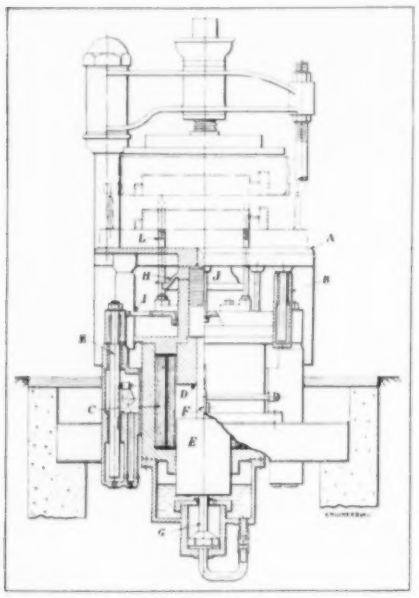


Diagram of working parts of molding machine with solenoid

According to *Engineering*, London, the actual squeeze under the action of the solenoid takes from 1 to 2 seconds. The pattern is drawn by gravity on the down stroke. In the illustration, the pattern table is shown at *A*. It is slotted for the attachment of the pattern plate and also has four slots clearing the stripping pins. It is guided by a rod *B* at each of the four corners. These slide in bearings of which a length of 6 inches still is available when the table is at the top of its stroke. The solenoid *C* is made in one or more sections according to the length of movement required and when energized acts upon both the stationary core *D* and the moving core *E*. Both of these are of mild steel, and the moving core is attached to the rod *F* which carries the table. Its lower part is connected to a piston working in a dashpot *G*. This device controls the speed at which the table moves. The length of stroke depends upon the distance between the stationary and moving cores. In the illustration this is shown at a maximum but by turning the handwheel *H*, the moving core and the table can be raised relatively to the stationary core.

The stripping frame is shown at *I*. It is attached to the pattern table by two lifting rods *J* and guided vertically by two plungers *K*, working in oil dashpots to cushion its downward movement when released. The plungers are slotted in such a manner that the dog catch seen at the right of the illustration, automatically holds the stripping frame and flask in the top position by the stripping pins *L*. This occurs when the squeeze has been completed, and the table then recedes and withdraws the pattern by gravity, a sudden fall being prevented by the dashpot *G*. The flask then is removed, the stripping frame is returned to the starting position by the release of the catches through the operation of the handle on the front of the machine.

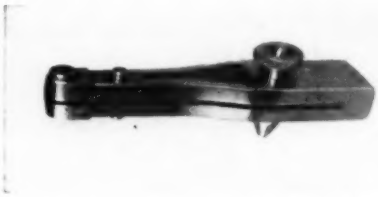
The stationary part of the machine consists of a stiff column carrying a swivelling arm on ball-thrust bearings. The outer end of the arm is held down when the squeeze is being effected by a long bolt or collar. When the flask is being filled and removed the arm is swung away.

Valve Controls Air

An air valve, which is claimed to be leak-proof, has been introduced by Briggs & Stratton Corp., Milwaukee. The unit supplies automatic intermittent control of compressed air blasts for ejecting work, keeping tools clean, and numerous other operations. The valve is constructed to resist both wear and corrosion. Valve, valve seat and valve spring are of stainless steel, and the air inlet bushing is of brass. An extra long valve guide is lined with a special griphited bronze bushing to reduce maintenance costs.

Portable Tester Gives Hardness Readings

R. Y. Ferner Co., Investment building, Washington, has introduced a portable hardness testing instrument adaptable for use where a drill or arbor press, a vise or a large clamp is available for applying the necessary pressure. The instrument consists, of a heavy piece of steel about 7 1/4 inches long, 7/8-inch thick and 1 5/8 inches wide at one end, tapering



The instrument may be used wherever a clamping device is available

to a width of 3/4-inch, slit to form a two-pronged spring. On the under side, near the end of the slit, a holder for the steel ball which is 5 millimeters diameter is mounted. Opposite this, on the upper prong is a knurled knob to which pressure is applied.

Pressure is released after a 30-second period and the impression is measured.

Lifting Magnet Designed for Foundry Use

A heavy duty lifting magnet, 39 inches in diameter and designed for use with overhead, crawler and gasoline or locomotive type cranes in foundries, scrapyards, etc., recently has been developed by the Electric Controller & Mfg. Co., 2700 East 79th street, Cleveland.

The design of the new magnet is essentially the same as for the other sizes made by that company. The magnet case is of high permeability steel with radial ribs on the top and extending down the sides to permit a large radiating surface thus providing cool operation. Renewable pole shoes and a heavily ribbed manganese steel outer bottom plate are held

in position against the machined surfaces on the magnet housing by selflocking through bolts. The magnet coil is strap wound, and after winding, is treated by a special vacuum impregnation process making the coil a moisture-proof unit.

Mount Exhaust Unit on Grinder Base

Standard Electrical Tool Co., Cincinnati, recently has developed a new motor driven exhaust unit which may be mounted on heavy duty grinders and buffers. The accompanying illustration shows the new equipment installed on a combination grinding and buffing machine. Both the grinder and buffer sides of the machine are fitted with enclosed hinged door guards, each having exhaust outlet. An exhaust unit with a ¾-horsepower motor running at 2600 revolutions per minute is mounted on the back of the pedestal. The motor driven unit is fitted with a dust collecting bag.

A dust collecting bag is used

Mill Type Starters

A new line of general purpose mill type starters for constant speed direct current motors has been announced by the General Electric Co., Schenectady, N. Y. These starters utilize newly developed accelerating contactors which have been designed not only to act in the capacity of a relay to provide time delay, but also to short out the starting resistor by a contact finger. The accelerating contactors are equipped with silver-faced tips so as to eliminate oxidation difficulties.

Case Hardening Service Co., 2281 Scranton road, Cleveland, has been appointed representative of the Ray Burner Co., San Francisco, for the sale of oil burners in Cleveland and vicinity.

Mask Is Designed To Keep Out Outside Air

Chicago Eye Shield Co., 2300 Warren boulevard, Chicago, has introduced a new mask designed especially for sandblasting work. The mask is designed to seal the face of the wearer against outside air, and is cushioned against the face by a pneumatic cushion. Air under pressure enters the mask through a metal tube shaped to release the air at certain advantageous points.

Air under pressure enters through a metal tube

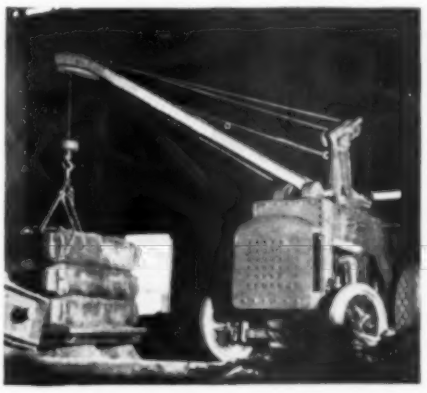
Main air supply is released in a chamber at the lower end of the mask and is dispensed by passing through a baffled plate, filtered through a sponge and directed past the nose and mouth of the wearer. This air stream provides a constant and steady flow of fresh air for breathing. The mask is supplied complete with rubber hose, regulating valve, air line coupling, belt and canvas hood with screen front. A view of the mask is shown in the accompanying illustration.

Tachometer Reading Is Fixed Automatically

A direct reading hand tachometer with an automatic fixed reading has been developed by the Amthor Testing Instrument Co. Inc., Brooklyn, N. Y. While in the ordinary tachometer the pointer drops back to zero when it is taken from the machine, in the new instrument the reading is fixed automatically on the dial which permits use in places where it is awkward to hold and read an instrument at the same time. The dial is graduated to read directly in revolutions per minute, but it is equipped with accessories so that feet per minute surface and belt speeds can be determined. The tachometer has four speed ranges, each of which is read separately over the entire dial. Each instrument is constructed with a finely balanced cross-pendulum governor movement, and is hand calibrated for accuracy. Instruments can be supplied to test directly any speed up to 12,000 revolutions per minute.

Unit May Be Used Either as Shovel or Crane

Bucyrus-Erie Co., South Milwaukee, Wis., recently has increased the capacity of its crane and tractor unit to 4500 pounds. The unit may be used as a stationary revolving boom crane, as a crane traveling with a load or as a tractor. Special features claimed include extreme mobility, compact design, and many items of special equipment. It is pointed out that the unit lifts and swings or carries loads to points where needed. It may be used to load and unload trucks and cars, sort and pile stored material, handle castings and other materials, etc.

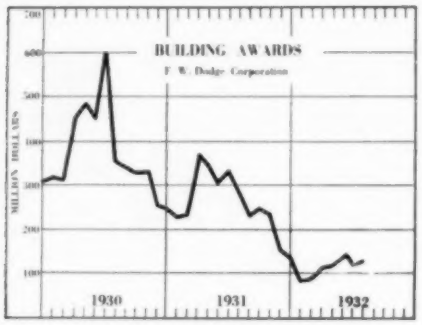


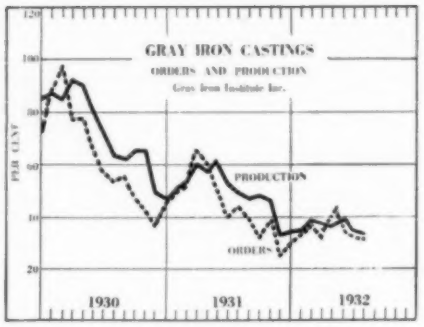
The crane may be used to handle loads in the foundry

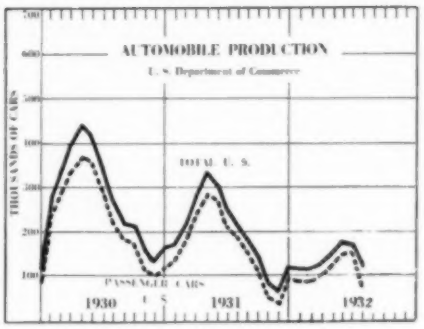
The unit may be equipped with either McCormick-Deering or Case engines. It may be mounted on wheels or provided with a crawler mounting.

To Make Sand Mixers In Canada

National Engineering Co., 549 Washington boulevard, Chicago, has completed arrangements whereby its products which include sand mixers, bucket loaders and aerators will be manufactured in Canada by the Dominion Engineering Works Ltd., Montreal, P. Q., for Canadian users. Sand handling, sand preparing, mold handling and conveying equipment, also designed by the National Engineering Co., will be manufactured by the Dominion Bridge Co. and its affiliated companies for Canadian users.







Foundry Activities

Reflect Industrial Trends

GLENWOOD, RANGE CO., Taunton, Mass., recently purchased the Fuller & Warren Co., stove builders, Troy, N. Y. Patterns have been moved to Taunton where the Stewart ranges now are being made. Output of the Glenwood company has been increased with the plant operating 6 days a week.

* * *

Ernest Bessette, 4426 St. Andre street, Montreal, Que., plans to build a foundry on Moreau street, to cost about $25,000.

* * *

Keeley Stove Co., Columbia, Penn., recently celebrated the fiftieth anniversary of the founding of the company.

* * *

Babcock & Wilcox Co., 85 Liberty street, New York, will concentrate all purchasing at its Barberton, O., works, after Sept. 1.

* * *

Antaciron has been incorporated at Wellsville, N. Y., with $5000 capital to manufacture castings, by G. T. Vandermeulen, Buffalo.

* * *

A. P. Smith Mfg. Co., East Orange, N. J., has reopened its iron foundry on a three-day-a-week basis, having been closed since Dec. 15, 1931.

* * *

Richardson & Boynton Co., Dover, N. J., resumed operations Aug. 15 after a shutdown of six weeks. Two hundred men are employed.

* * *

Crescent Foundry Co., 1210 South Johnson street, Amarillo, Tex., recently purchased the business and plant of the Amarillo Foundry Co.

* * *

Paul R. Pelz, 2 East 23rd St., New York, importer of clocks desires to purchase cast iron weights for such clocks.

* * *

Logansport Radiator Equipment Co., Logansport, Ind., has resumed operations after being idle for several months.

* * *

Aluminum & Brass Goods Inc., 17131 Filer avenue, Detroit, has been incorporated with $40,000 capital to manufacture brass and aluminum castings, by Edward C. Hoenickel, 1 Fairwood avenue, Pleasant Ridge, Mich.

* * *

Prospects for increased activity in malleable iron castings industry were forecast at the annual meeting of stockholders, Moline Iron Works, Moline, Ill., recently.

* * *

Ferguson & Lange Foundries Inc., 1039 Willow street, Chicago, has been incorporated to operate a foundry and general machine shop by Louis Weckerly, Ray M. Northrup and Daniel P. Kerwin.

* * *

Abram Cox Mfg. Corp. Lansdale, Pa., has been incorporated with $5000 capital to manufacture metal castings and stampings, by Abram C. Mot Jr., East Main street, Lansdale, Pa.

* * *

Carlson Pattern Shop, 522 Page boulevard, Springfield, Mass., recently was organized and placed in operation by Oscar A. Carlson, for the past 11 years connected with Hastings & Schoen, Springfield.

* * *

Staver Foundry Co., Formerly the Virginia Foundry Co., Virginia, Minn., recently has built a new modern jobbing foundry. John F. Staver is president and B. E. Staver is vice president and general manager.

* * *

H. W. Knight & Son Inc., Seneca Falls, N. Y., has bought the pattern letter business of the A. W. Brim Co., Seneca Falls. The Knight company has specialized in pattern letters for 60 years and now has a complete line.

* * *

Art Cast Products Inc., California avenue and Twenty-sixth place, Chi-

RAW MATERIAL PRICES
Sept. 7, 1932

Iron	
No. 2 foundry, Valley	$14.50
No. 2 Southern, Birmingham	11.00
No. 2 foundry, Chicago	15.50
No. 2 foundry, Buffalo	16.00
Basic, Valley	14.00
Basic, Buffalo	15.50 to 16.00
Malleable, Chicago	15.50
Malleable, Buffalo	16.50
Coke	
Connellsville beehive coke	$2.75 to 4.25
Wise county beehive coke	4.25 to 5.00
Detroit by-product coke	8.00
Scrap	
Heavy melting steel, Valley	$10.00 to 10.50
Heavy melting steel, Pitts.	9.00 to 9.50
Heavy melting steel, Chicago	5.75 to 6.00
Stove plate, Buffalo	6.75 to 7.00
Stove plate, Chicago	6.50 to 7.00
No. 1 cast, New York	6.50 to 7.00
No. 1 cast, Chicago	6.50 to 7.00
No. 1 cast, Philadelphia	9.00 to 9.50
No. 1 cast, Pittsburgh	9.50 to 10.00
No. 1 cast, Birmingham	9.00 to 9.50
Car wheels, iron, Pittsburgh	9.00 to 9.50
Car wheels, iron, Chicago	7.00 to 7.50
Railroad malleable, Chicago	6.50 to 7.00
Agricultural mal., Chicago	5.00 to 5.50
Malleable, Buffalo	8.00 to 8.50
Nonferrous Metals	**Cents per pound**
Casting copper, refinery	6.00
Straits tin	25.70
Aluminum, No. 12, producers	22.00
Aluminum, No. 12 remelt	7.00 to 8.00
Lead, New York	3.60
Antimony, New York	5.50
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	3 37½ to 3.40

cago, has been incorporated to manufacture metal novelties, by Glenn L. Heffner and associates. Childs, Bobb & Wescott, Continental Illinois Bank building, are correspondents.

* * *

W. E. Scheffer & Sons Co., Ripon, Wis., will rebuild its foundry, practically destroyed by fire.

* * *

Empire Stove Co., 2333 West Main street, Belleville, Ill., has been incorporated with $30,000 capital to conduct a general stove and foundry business. W. R. Weber, 6 East Washington street, Belleville, is correspondent.

* * *

Graff Furnace Co., Scranton, Pa., recently in receivership, has sold patterns for its line of furnaces to the Faultless Heater Corp., Cleveland. Castings and furnaces for the Faultless company will be manufactured by the Forest City Foundries Co., Cleveland.

* * *

Pierce, Butler & Pierce Mfg. Corp., Zanesville, O., resumed operations the first of September, with approximately 200 men employed. The plant has been practically closed since May 15. General Manager Fred Witchie of the Zanesville plant believes prospects for continued operation of the plant during the fall and winter are extremely bright.

* * *

Officials of Aluminum Industries Inc. Cincinnati state automotive orders on hand, and expected to be closed soon, will keep the plant busy until the first of the year. Equipment of the St. Cloud plant is being transferred to Cincinnati for greater economy in operations.

* * *

New England range manufacturers continue to increase activities, the White-Warner Co., Taunton, Mass., recently recalled workers in all departments including 40 molders in the foundry. Florence Stove Co., Gardner, Mass., also has resumed operations on an active schedule.

* * *

Homer Furnace Co., Coldwater, Mich., has increased operation. The foundry is employing moulders six days each week with a night force running floors three nights a week. A contract with the Hudson Motor Car Co. for automobile castings is responsible for the increase.

* * *

Carson-Cadillac Corp. has been formed as a subsidiary of the Cadillac Malleable Iron Co., Cadillac, Mich., by H. Y. Carson. The new company will specialize in marketing a bell joint clamp for cast iron pipe which has been developed through exacting research to meet conditions encountered with cast iron mains under city streets.

* * *

Automatic Cone Valve Co., Mattoon, Ill., recently took over the plant of the Mattoon Engine Works. In addition to building the Chuse engines, the company will make automatic check valves, automatic stop valves and automatic liquid level control valves, etc. David D. Goldberg is president and general manager of the company.

* * *

Benjamin Stewart & Sons has been incorporated to operate a jobbing, brass, bronze and aluminum foundry at Mt. Carmel, Conn. Benjamin Stewart formerly was manager, Bridgeport Deoxidized Bronze Co., Bridgeport, Conn. He is a member of the executive committee on the Connecticut Nonferrous Foundrymen's association.

* * *

After experiencing a decrease of 22 per cent in sales for the fiscal year ending March 1, 1932, reflecting the tendency to defer needed but not absolutely necessary purchases during periods of depression, and low level of building contracts, the Holland Furnace Co., Holland, Mich., reports an increase in business due to sales of air-cooling and conditioning systems.

* * *

The Olympic Foundry Co., Seattle, Wash., has installed a small electric melting furnace for making cast iron. This furnace which was designed by the Greene Electric Furnace Co., Seattle, is intended for low power and long hours of operation. It is started at 4 a.m. and poured at regular intervals until midnight. It melts heats from 600 to 1000 pounds although an excess charge weighing 1800 pounds has been melted. Rust-resisting and high test iron, the latter ranging over 40,000 pounds per square inch tensile strength, are melted in the furnace. The average daily melt is 2-½ tons. The power imput is said to be 100 kilowatts.

Forgings and Malleable Castings versus Gray Iron

ANNUAL statistics just issued by the American Iron and Steel Institute show that foundry pig iron production last year was only 11.88 per cent of the total production of pig iron, excluding ferroalloys. That is just about half the proportion shown for quite a period of years up to 1906. The actual tonnage has decreased while total pig iron production underwent a great increase through 1929.

A common view has been simply that gray iron castings have been yielding to rolled steel as methods of pressing and stamping steel were improved, along with quality of steel, lending itself to these forming operations. That, however, is only part of the story, for there has been displacement also by malleable castings and steel forgings.

The Iron Age, April 7, 1932

Gray Iron Can Not Be Downed

PREDICTIONS were rife only a few years ago that the gray iron industry had seen its best days and that new products in alloy steels, in stampings and in welded materials would ultimately displace this well-known and long-used product. At that time there seemed to be some justification for such prophecies. But metallurgical research in the improvement of the cupola melting process itself, the use of the electric furnace and the addition of alloys have completely changed the picture. Today gray iron without alloys can be produced having physical and other properties thought impossible not so long ago. This has been brought about by the use and regulation of higher temperatures in melting and by the character of the charge in the cupola or in the electric furnace. By the addition of alloying elements it has also been found possible to so change the structure and properties of gray iron that a product is now being commercially made which in many respects approaches steel and other cast materials. In all this heat treatment has been an important factor.

The Iron Age, August 11, 1932

New Trade Publications

GRINDING WHEELS — "What to Specify" is the subject of a folder recently prepared by the Norton Co., Worcester, Mass. Information includes a list of wheel numbers for both low-speed operation and high-speed operation for a variety of cast products including aluminum, brass and bronze, cast iron, malleable iron and steel.

BRAKE DRUMS—A folder describing Ford replacement brake drums of gunite, recently has been issued by the Gunite Foundries Corp., Rockford, Ill.

ELECTRIC MOTORS—Ohio Electric Mfg. Co., 5900 Maurice avenue, Cleveland, has published a bulletin showing special frame designs for its electric motors.

MAGNESIUM ALLOYS—Dow Chemical Co., Midland, Mich., has published additional data sheets covering chemical compositions and uses of Dowmetal alloys.

STEEL CASTINGS—"The Effect of Design on the Making of Steel Castings" is the title of a folder recently published by the Detroit Steel Casting Co., Detroit.

MOTORS—General Electric Co., Schenectady, N. Y., has published its bulletin GEA-1542 discussing its constant-speed, direct-current motors. Illustrations show various parts and features of the equipment.

LIFT TRUCKS—Tidy Products Inc., Chrysler building, New York, in their recent bulletin describes construction and illustrates operation of several types of hand-operated tilt trucks for handling barrels, carboys and drums.

WIRE ROPE—Advantages of its particular type of wire rope are contained in a booklet recently published by the American Cable Co. Inc., 230 Park avenue, New York. Various uses for the rope also are included.

CAST IRON TOYS—Littlestown Hardware & Foundry Co. Inc., Littlestown, Pa. has published a folder showing a few of its numerous book ends, door stops and other cast iron art novelties.

PYROMETERS—An optical pyrometer suitable for measuring temperatures up to 2600, 3700 and 5500 degrees Fahr. on respective ranges is described in a folder recently prepared by the Bacharach Industrial Instrument Co., 7000 Bennett street, Pittsburgh.

AIR SEPARATOR—Leavitt Machine Co., Orange, Mass., has published a catalog on its automatic separators for removing moisture and oil from compressed air. The catalog includes information on the principle of operation, suggestions for separators, proper installation of equipment and illustrations of various types produced. Automatic receiver drains also are described.

BELT DRIVE—Worthington Pump & Machinery Corp., Harrison, N. J. has prepared a small booklet discussing its V-belts running in V-grooved sheaves for power transmission. Reproductions of photographs show the use of the belts in various installations.

DEOXIDIZER—Silicon-manganese alloys for the deoxidation of steel are discussed in bulletin No. SM-1, recently published by the Electro Metallurgical Co., Carbide and Carbon building, New York. It is pointed out in the publication that the proper use of alloys leads to a cleaner steel.

ARC WELDER—In a folder entitled "The Novice Understands and the Expert Appreciates," the Harnischfeger Corp., 4400 West National avenue, Milwaukee, has described the features of its line of arc welders of either the electric motor-driven type or the gas engine-driven type.

VENTILATING FANS—Construction details, safety features, capacities, dimensions and prices feature a bulletin on a line of ventilating fans recently prepared by the L. J. Wing Mfg. Co., 154 West Fourteenth street, New York. Other heating and ventilating products are mentioned such as exhausters, heaters, cooling fans, etc.

HINGE TUBES—Smith & Richarson Mfg. Co., Geneva, Ill., recently has issued an interesting catalog giving a large amount of engineering data on hinge tubes and tin forms. Included in the catalog are sketches showing how tin forms can be used as well as information on other types of chaplets, skim gates, and door catches.

ELECTRODES—Numerous applications of inorganic flux coated welding electrodes are described in a new booklet published by the Metal & Thermit Corp., 120 Broadway, New York. The publication also includes information on welding of mild steel and boiler plate, stainless steel alloys, manganese steel, high carbon steel and stainless iron.

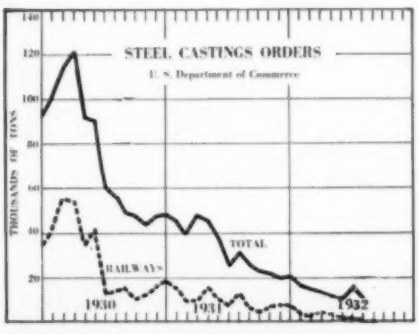
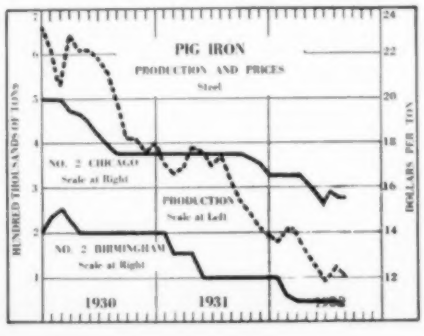
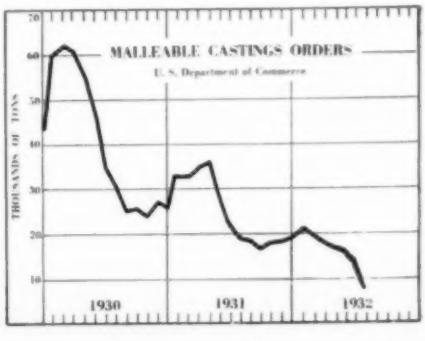
GAS GENERATOR—A self-contained generating unit operating on a standard liquid fuel for all industrial heating applications is described and illustrated in a bulletin recently prepared by the Railway Locomotor Co., 59 East Van Buren street, Chicago. It is pointed out that in core ovens, annealing ovens, kilns and similar applications, a low fuel consumption is secured with the device and at the same time temperatures may be maintained and controlled with great accuracy.

FURNACES—A series of bulletins has been published by the W. S. Rockwell Co., 50 Church street, New York, describing various types of heating and melting furnaces. These include a continuous pusher-type furnace, rotary heat treating furnaces, rotary carburizing furnaces, and continuous belt conveyor type units.

TESTING EQUIPMENT — Baldwin-Southwark Corp., Southwark division, Philadelphia, has published a folder devoted to its stress-strain recorder. It is pointed out that the recorder is suitable for research work, due to the high degree of precision of the diagrams obtained for it, and suitable for routine testing because it is automatic in operation.

CIRCUIT BREAKERS—A new group of circuit breakers, based on the De-Ion principle of arc extinction, for the replacement of open knife switches and air circuit breakers is announced in two publications of the Westinghouse Electric Mfg. Co., East Pittsburgh, Pa. The publications present data on construction, operation and the general features of the circuit breakers.

HEALTH—"Air Conditions and the Comfort of Workers" is the subject of a bulletin recently prepared by the Metropolitan Life Insurance Co., New York. The booklet deals with temperature standards for comfort, measurement of physical properties of air, conditioned air, the effect of high atmospheric temperatures on workers, air pressure and air cleanliness

MATERIAL HANDLING — "Mechanical Moving of All Foundry Loads" is the subject of a bulletin recently issued by the Cleveland Electric Tramrail division of the Cleveland Crane & Engineering Co., Wickliffe, O. Illustrations show the applications of tramrail to the pattern storage, molding floor, material storage, pouring stations, grinding department and material storage yards.

BUDGETS—Metropolitan Life Insurance Co., New York, recently has published "The Manufacturing Expense Budget," which is a report based on a survey of the budgetary practices of a number of manufacturing organizations. The problem of manufacturing expense controls and the several types of budgets used for the purpose are described and illustrated, and the complete procedure of four companies is outlined and analyzed in detail.